Title eCulture: Examining and Quantifying Cultural Differences in User Acceptance Between Chinese and British Web Site Users

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eCULTURE: EXAMINING AND QUANTIFYING CULTURAL DIFFERENCES IN USER ACCEPTANCE BETWEEN CHINESE AND BRITISH WEB SITE USERS

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by

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ABSTRACT

The World Wide Web (WWW) has become an important medium for communicating between people all over the world. It is regarded as a global system and is associated with a wide user and social system diversity. The effects of differing user-groups and their associated cultures on user acceptance of web sites can be significant, and as a result understanding the behaviour of web users in various cultures is becoming a significant concern.

The eCulture research project is based on previous classical theories and research in culture. It applies a factorial experimental design strategy (the Taguchi method) in cross-cultural usability / acceptability, together with other approaches such as semiotic analysis and card sorting.

Two types of analysis, both top-down and bottom-up have been implemented to investigate differences in web site usability and acceptability between users from Mainland China and the United Kingdom. Based on experiments on web sites investigating the relationship between cultural issues and usability /acceptability aspects between Chinese and British web users, several issues, such as *cultural factors, cognitive abilities*, *social semiotic* differences and other issues have emerged.

One of the goals has been to develop 'cultural fingerprints' for both web sites and users in different cultures. By comparing cultural and site fingerprints, usability and acceptability of web sites can be diagrammatically matched to the target culture. Experiments investigating qualitative factors and quantitative data collection and analysis based on the Taguchi method has led to the successful development of two versions of 'cultural fingerprint' for both web sites and target cultures in the UK and China.

It has been possible to relate these studies to a wider body of knowledge, and to suggest ways in which the work may be extended in the future.

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Finally, this thesis is dedicated to the memory of my mother- Guifang Wu, who will always be sadly missed.

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Introduction

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This Chapter attempts to discuss the background relating to web site development in China and the UK, and to introduce the potential significance of usability and acceptability. Also it introduces the main aim and objectives of this thesis and places the eCulture: UK and China project in the context of the author's experiences to date.

1.1. China and the UK, the Internet and e-commerce

Economic and trade co-operation between China and the UK has developed encouragingly in recent years. With massive potential for further co-operation between the two countries, an even greater prospect is now beginning to emerge. Many events have illustrated that China is becoming an increasingly vital, visible and integral member of the global community. Hosting the Asia Pacific Co-operation summit in Shanghai in 2002, the 2008 Olympics in Beijing and accession to the World Trade Organisation (WTO) will all further strengthen China's ability to maintain sturdy economic growth. In turn, this will enable China to offer various business opportunities for British developers, investors and technology owners who wish to do business in the country.

The United Kingdom is currently China's second largest trading partner and the largest among the EU countries. *Chinese Customer statistics* (2002) show that bilateral trade between China and the UK was US$ 10.3 billions in 2001, an increase of 4.1% on previous year. The statistics also show that UK companies invested in a total of 3072 projects in China by the end of 2001. Contractual and realised investment figures stood at US$18.5 billion and nearly US$10 billion respectively.

The World Wide Web (WWW) has become an important medium for communication and commerce between people all over the world. The web site is now an established channel of communication between a whole variety of organisations and their diverse groups of stakeholders. In the e-commerce environment the web makes a global market accessible to even the smallest company.

Over the period July to September 2002, 11.4 million households in the UK accessed the Internet from home. This is equivalent to 46 percent of all UK households and is over twice the number three years earlier and an increase of seven percent versus the same period last year (NUA, Internet Survey, 2003).

China is also one of the fastest growing regions for Internet usage, and web site registrations and has rapidly developing Internet technologies. The Internet was first available in China in 1994. Since then, the number of Chinese users has kept increasing (as shown in Table 1.1). According to the latest report from CINIC (2004), Chinese Internet users rose by 34.5 percent just in the last 12 months. Chinese is expected to be the dominant language on the web by 2007. This growth pattern both within China and elsewhere on a global scale presents opportunities for companies to gain access to global markets through e-commerce.

Table 1.1: Number of Internet users and web sites in Mainland China

Year	Number of internet users	Number of web sites
1998	1,175,000	3,700
1999	4,000,000	9,906
2000	16,900,000	27,289
2001	22,500,000	265,405
2002	59.100,000	371,213
2003	79,500,000	595,550

1.2. The global Internet

The WWW can be regarded as a global system and is associated with a wide user and social system diversity. The effects of differing user-groups and their associated cultures on user acceptance of web sites can be significant, and as a result understanding the behaviour of web users in various cultures is becoming a significant concern. In developing successful international e-commerce applications in the business to customer (B2C) or business to business (B2B) domains, many organisations are now beginning to realise that they need to understand, and then address the needs of this culturally diverse user base. A survey by *World Trade* (2000) echoed the view of researchers in cross-cultural usability that the more organisations adapt web sites to local markets, the better off they should be. As *World Trade* summarise, putting the '*think globally, act locally'* principle into action, is not simple but the rewards can be large.

The problem is that people differ across regional, linguistic and country boundaries and user's expectation of web site design is strongly influenced by their local cultural perspective. These differences need to be considered rather than ignored. In spite of its potential importance as a trading partner, until recently there remained a surprising lack of comparative empirical studies to inform us about the cultural differences between Chinese and British Internet users, which may exist.

1.3. Cross-cultural usability and acceptability

Colloquially software is often described in relation to how 'user-friendly' it is. Whilst people have some idea what is meant by the term, a far better one is 'usability'. Indeed software *usability* is defined by the International Standards Organisation (ISO 9241) in terms of *efficiency*, *effectiveness* and *satisfaction*. For many software products usability can be quantitatively measured, and as a result it is a major determinant of overall software and systems quality. In the academic environment usability lies within the discipline of human-computer interaction

(HCI), an area that has considerable growth within the last decade. Usability is all about making software intuitive to use, easy to learn and satisfying to use and is claimed to be crucial to the future success of web development (Ferre et al, 2001).

The differences in usability requirements generated across the regional, linguistic and country boundaries described above are often referred to within the concept of '*cross-cultural usability*'. For web sites this involves providing an effective means of communication between a global web site owner and a local user. Indeed there are two broad types of specific usability issue inherent in international web site design. Firstly there are 'hard' issues such as language and format conventions. Another interesting issues are 'soft' issues, those that underpin cultural and cognitive dimensions and focus on the ways in which people in different cultures interact with computers and web sites. (Smith et al, 2002).

A web site may be considered to be highly usable in all the usual usability senses, but it may not be totally acceptable by users for various reasons. At a basic level usability may be evidenced in a site that is 'simple to use'. However a merely simple site may not be fully acceptable to the target user group. Many other factors, such as aesthetic design and issues relating to branding and trust, determine the way in which users will respond to, and the extent to which they will adopt web sites could be significant as well. It is necessary therefore to modify the concept of cross-cultural web usability to that of *cross-cultural web acceptability.*

In this thesis *cross-cultural web acceptability* is defined as follows:

> *'the extent to which the site delivers a user experience that matches local cultural needs and thereby leads to high levels of adoption'.*

Cross-cultural acceptability is about ensuring that web sites provide an effective means of communication between a global web site owner and a local user.

1.4. The 'eCulture: UK and China' research project: aims and objectives

The 'eCulture: UK and China' research project which has underpinned this thesis is rooted in previous classical theories and research in cultural differences. Within the field of cross-cultural acceptability it applies quantitative factorial experimental design experiments (based upon Taguchi methods) together with other qualitative approaches such as semiotic analysis and card sorting.

The overall aim of the study has been to research and specify the specific cultural needs of Chinese and British web site users, with the ultimate goal of providing global web site owners and developers with further guidance on how to build successful web sites within the Chinese context.

In particular it has sought to address the following three key objectives:

1. To ascertain the extent to which there are genuine differences in acceptability requirements between UK and Chinese users.
2. To explore, categorise and measure the characteristics of such differences.
3. To relate such differences to the web site design process so as to provide guidance to web site developers in order to build usable sites in the Chinese context.

Two key approaches to study - both 'top-down' approaches and 'bottom-up' approaches, have been implemented to investigate differences in web site usability and acceptability between users from Mainland China and the United Kingdom.

One of the key goals that emerged within the project (and one of the key contributions to knowledge within this thesis) is the concept of the 'cultural fingerprint' which can be specified for both web sites and users in different cultures. By comparing cultural and site fingerprints, usability and acceptability of web sites can be matched to the target culture. Experimentation investigating qualitative factors and quantitative data collection and analysis based on the

Taguchi method has led to the successful development of two version of the 'cultural fingerprint' for both web sites and target cultures in the UK and China.

The overall thrust of the eCulture: UK and China research project is to contribute to a full methodology for cross cultural web usability/ acceptability so as to make it being capable of reaching across cultural and international boundaries.

1.5 The motivation of this research

The author comes from China, a big developing country with the world's largest population and over 5,000 years history and civilisation. In total fifty-six different nationalities resident in China and each having their own cultures. Personal knowledge of these has provided the author with very worthy and numerous sources of background for the study.

Chinese is the author's mother tongue, but he has been studying English for over a decade and has lived in the UK for several years. This bilingual background has provided an effective platform from which to investigate and evaluate the similarities and differences between British and Chinese.

Research into cross-cultural usability and acceptability research is important not only for both China and the UK, but all over the world. Having the opportunity to participate in this challenging research and to make personal contribution to the field of the study has provided the author great pleasure.

The University of Luton has one of the most diverse student populations in the UK. Over 140 different countries are represented in the student body - more than double the national average. This multiple cultural environment has provided the author a feasible chance to carry on experiment and evaluation. It has also been possible to relate this study to a wider body of knowledge for other nations and cultures.

Summary

This Chapter has

- Reviewed some elementary background relating to web site development in China and the UK, and the prospect of global Internet and e-commerce development;
- Introduced the potential significance of usability and acceptability;
- Established the main aim and objectives of this thesis.

Chapter 2

Theoretical background and related research

Chapter objectives

This Chapter aims to present a theoretical background and associated research underpinning web site user acceptance. It focuses on definitions of usability and acceptability. Specifically it presents a discussion of theoretical models of culture and relates these to the semiotic paradigm, as these are the two core theories underpinning the eCulture project.

2.1 Introduction

Information and communication technology has penetrated nearly all corners of the globe. According to new research from Nielsen-Netratings (Feb 25, 2003), 580 million people have Internet access, compared to 563 million in the third quarter of 2002. The US now accounts for 29 percent of the global Internet access universe, followed by Europe with 23 percent, Asia-Pacific with 13 percent and Latin America with 2 percent.

This ever-growing Internet use has enabled the emergence of new products and services at a global scale. As stated in Chapter 1, the web site is now an established channel of communication between a whole variety of organisations and their diverse groups of stakeholders. Whilst projections for the future vary greatly the Internet offers massive potential in a wide range of fields. However for global web sites to be successful many organisations are now beginning to realise that they need to understand, and then address the needs of a culturally diverse user base. This chapter reviews theoretical background and previous research related to the multi-disciplinary field of cross-cultural web site development.

2.2 Web sites for a global audience

Addressing international web site design means designing and building web sites specifically for a global cross-cultural audience. In fact, producing good international software products has always been difficult and there are many examples in the past of systems that have failed or caused their users great problems (del Galdo, 1990; Fernandez, 1995). Cultural differences have significance not only for the design itself but also for the process of design. Unfortunately, culture is often the most readily overlooked aspect of international web site development. Too often, companies pay more attention in the politics of 'real estate', artistic templates and brand messaging, and they rarely consider how important a role culture plays in the very design of a web site.

In contrast, in some circles there is an increasing interest in culturally relevant interface design - deriving suitable designs for indigenous people. For example, Ghosh et al. (2003) proposed design considerations for Micro-finance management system for rural, semi-literate users in India. The community of people localising products and systems (and those at the leading edge of research in this area) is small, but growing. Increasingly, industry, academia and government realise the importance of adapting everything from computer interfaces to industrial packaging and family planning advice to the cultures and expectations of intended users.

Cultural diversity makes it unrealistic for software designers to rely on intuition or personal experience of interface design. However, designing multiple interfaces for different user groups adds significantly to the cost of development. In relation to software localisation, Day (1996) describes three levels of classification of the types of software for a global audience:

- ***Globalisation***, applying an allegedly culture-less standard to be used across different cultures. In globalisation, a product or system may be exported with little change from its culture of origin. People in other cultures must learn its idiosyncrasies before using it.

- ***Internationalisation***, designing base structures for later local customisation, Internationalisation implies that unique aspects of the culture of origin have been removed, partly to avoid offence to users in other "target" cultures and partly to facilitate customisation of the base product or system for or in those cultures.
- ***Localisation***, developing specific interfaces to meet particular local markets.

2.3 Usability and acceptability within international web design

Usability is the mission critical component in providing successful international and cross-cultural www interface solutions. According to the International Standards Organisation (ISO) model (ISO 9241), *usability* is " *the extent to which a product can be used by specified users to achieve specified gaols with effectiveness, efficiency, and satisfaction in a specified context of use*". Usability is defined to measure the following:

- ***Efficiency***, the accuracy and completeness the user achieves with respect to the goals;
- ***Effectiveness***, the user effort required to achieve the user and domain goal;
- ***Satisfaction***, the measure of user satisfaction on a number of attributes.

The field of web site usability is about finding the methods and principles that can allow web sites to be designed in ways that facilitate, rather than obstruct, interaction with a human user. The quest for web site usability is the search for ways of creating excellent communication and dialogs between two 'actors': the web application (created by the mind of designers) and the human user. The aim is to provide efficient, effective and satisfying outcomes for all concerned stakeholders (any one who has a 'stake' in the design, i.e. customers, business, designers, marketing and so on). (Cato, 2000).

Cross-cultural web usability expands the concept of usability, to address the needs of a global audience. *Cross-cultural web usability* is about making web sites an effective means of communication between a global web site owner and a local user. In cross-cultural web site usability development, the following issues are critical:

- How does the usability of a web site design stand up to the requirements of users in different markets, and of different nationalities, cultures or languages?
- Is it possible to create a 'culturally neutral' site that is easy to localise and translate?
- How easily can web site design be localised for different markets?

Interface design is about making the functionality of the software available to the user. It has to be easy to understand, easy to use, visually attractive, include the appropriate functionality and be consistent in design. When a user does not understand an interface, it will be hard to work with the system and there is an increased risk that the system will not be accepted. Overall acceptability of a computer system is a combination of its social acceptability and its practical acceptability (Nielsen, 1993). *Social acceptability* indicates whether the users find the system easy to understand, useful for performing tasks or even fun to use. *Practical acceptability* includes traditional categories such as cost, support, reliability, and compatibility with existing systems.

The origins of acceptability research started with research into technology acceptance. Davis' TAM (Technology Acceptance Model) (Davis, 1989; 1993; 1996) specifies the causal relationships between system design features, perceived usefulness, perceived ease of use, attitude toward using, and actual usage behaviour. Hubona and Blanton (1996) presented a study in which participants (151 volunteer undergraduate business administration students) assessed the usefulness and ease of use of qualitatively distinct user interface features (e.g. rules, tree diagram, verbal windows, hypertext). Findings indicate that perceived ease of use contributes significantly to enhanced levels of user confidence in

decision quality.

Evers and Day (1997) adapted the TAM model in their survey research to incorporate aspects of culture in surveying international students on cross-cultural differences in interface acceptance. Results indicated that preferences in interface design are culture related and do indeed affect interface acceptance. Other research suggests that technology acceptance is related to factors such as experience level (Handzic et al, 1994) and user involvement (Hawk, 1993).

A web site may be considered to be highly usable in all the usual usability senses, but it may not be socially acceptable for various reasons. At a basic level usability may be evidenced in a site that is 'simple to use'. However a merely simple site may not be fully acceptable to the target user group. Many other factors, such as aesthetic design and issues relating to branding and trust, determine the way in which users will respond to, and the extent to which they will adopt web sites could be significant as well. Therefore, Smith and Chang (2003) extend cross-cultural web usability to cross-cultural web acceptability, which is defined as

> *'The extent to which the site delivers a user experience that matches local cultural needs and thereby leads to high levels of adoption'.*

Cross-cultural acceptability is aiming to make web sites an effective means of communication between a global web site owner and a local user.

In cross-cultural web site design it is important to focus on design characteristics that are sensitive to demographic differences, but it is often not clear what these are. Smith et al (2002) identify two broad types of usability / acceptability issues that inherent in international web site design. There are

- *Hard / site oriented issues,* these clearly identified and tangible issues, which directly effects the way that a user interacts with the site
- *Soft / user oriented issues*, these are more subtle cognitive and cultural issues

that focus on the ways in which people in different cultures interact with, and respond to web sites.

When localising a product or service, idiomatic language translation is required. But beyond simple translation, details such as appropriateness of colours, icons, metaphors, how pictorial information is presented and organised, preferences for text versus graphics, directionality for how the language is written (i.e. right to left), help features, and navigation tools, among others must be considered (Marcus, 1999).

2.4 Hard / site design issues

Hard issues are clearly identified issues such as language, formats, imaging, colour, metaphor, branding and trust, which directly effect the way that a user interacts with the site. Some characteristics and guidelines of hard cross-cultural web usability issues could be summarised as following:

2.4.1 Language

Language is best understood as one of a set of human channels of communication (Ellis and Beattie, 1986). Human channels in language communication permit an exchange of information between two or more people in a conversation. Language differs from other channels in that it is the most highly developed channel of human communication, and the one that makes the greatest difference between human beings and other animals. There are many and obvious differences between languages, such as the number and kinds of speech sounds and the ways they are combined vary in different languages. Languages also differ in their methods for combining speech sounds and in the variation of word forms found. It is also widely believed that there are gender differences and ethnic differences in language (Wood, 1999).

Language is extremely important to human interaction because it is how we reach

out to make contact with our surroundings. If we were to survey a normal day, we would soon see that we use word for a wide variety of purposes. Word differences are obvious in various languages. Phonology also varies culturally. In English, there are 21 consonant sounds and 5 vowels that combine to form 38 various sounds. Grammatical structures are unique to each language as well. In English, there are singular and plural nouns and pronouns and verb tenses express contrast between past, present, and future acts. Syntax, or the word order and structure of sentences also vary depending on the language.

Language and its cultural influence are exemplified in the theoretical formulations of the Sapir-Whorf hypothesis (Sapir, 1949; Whorf, 1956), which in essence states that language is a guide to " social reality". This hypothesis implies that language is not simply a means of reporting experience but, more important, it is a way of defining experience. The real world is to a large extent unconsciously built up on the language habits of the group. No two languages are ever sufficiently similar to be considered as representing the same social reality. Although complete acceptance of Sapir-Whof hypothesis may be controversial, its application to culture and language is clear: language is reflection of culture, and culture is a reflection of language. We have seen that culture influences language by way of symbols and rules as well as our perceptions of the universe. Equally important is the fact that meaning shifts from culture to culture.

Cyberatlas (2000), a web site which offers statistics on internet usage, states that by 2002, Internet users will be predominantly non-English speaking and by 2005, this will account for 60 percent of Internet users. Chinese is expected to be the dominant language on the web by 2007. *Computer Economics* (2000), an online advisory service, predicts that there will be a 60% increase in Internet usage among English speakers during the next 6 years. At the same time, the non-English speaking market will grow by 150%. The growth of the non-English speaking market shows that it will become imperative that companies offer multiple language choices on their web sites. Very often, web sites containing English, are accessed by non-native speakers of English. Kukulska-Hulme (1999)

argues that even native English is made up of geographically determined varieties, which prohibits the possibility to use a Standard English for all English speakers.

For English language sites designed for a global audience it is necessary to analyse the style and complexity of language used. It may be appropriate to assume that global users have some understanding of English, but there are a number of areas of difficulty for non-native English speakers such as level of complexity, and the use of culture-specific meanings, abbreviations, idiomatic expressions and semi-technical terms. (Sacher and Margolis, 2000). For interfaces in different cultural settings, users have a different cultural background from the designers. Because of this, knowledge will differ and communication may be impeded. Other issues, such as: use of style / voice, grammar / punctuation, abbreviations / acronyms and jargon, should also be concerned for cross-cultural web development

2.4.2 Formats

Format including a range of issues such as

- Currency format(s)
- Date/time formats, calendars

The format and presentation of many classes of common data and text vary from country to country, not just by language. This means that, although Belgium, France and Switzerland use the French as their language, their local conventions may differ significantly. In addition, in countries such as Switzerland where at least three different languages are spoken (French, German and Italian) depending on geographic region, local conventions and language differ within a single country. In relation to formats, the following issues need to be addressed for effective localising: currency format(s), date/time formats, calendars, numeric formats, telephone number formats and address formats.

2.4.3 Images

Images are media rich in meaning, conveying messages that textual information may fail to transmit across cultures requiring conversion them for use in another cultural context. Images exist as a representational form distinct from other forms because sensory and perceptual systems such as vision, hearing and touch all relies on iconic "image like" forms in the apprehension, recollection and re-presentation of the world as accessed through these modular systems. In the web site, the most prominent issues, which use images, are pictures, graphics, icons and cartoons.

2.4.4 Colour

Colour refers to the characteristics of light by which the individual is made aware of objects or light sources through the receptors of the eye, involving hue, lightness, and saturation for objects and hue, brightness, and saturation for light sources (Kaye, 1998). Importantly colour associations vary considerably across countries and cultures. The Color-Culture Table in Table 2.1 illustrates some of the different meanings (Boor and Russo, 1993). Red for example implies anger in Japan, but happiness in China. White is associated with death in China but purity in the United States.

Table 2.1: The colour-culture table
(Boor and Russo, 1993).

COLOUR	CHINA	JAPAN	EGYPT	FRANCE	UNITED STATES
Red	Happiness	Anger Danger	Death	Aristocracy	Danger Stop
Blue	Heavens Clouds	Villainy	Virtue Faith Truth	Freedom Peace	Masculine
Green	Heavens	Future Youth Energy	Fertility Strength	Criminality	Safety Go
Yellow	Birth Wealth Power	Grace Nobility	Happiness Prosperity	Temporary	Cowardice Temporary
White	Death Purity	Death	Joy	Neutrality	Purity

When applied to Web design, colour may impact the user's expectations about navigation, links, and content, for example, as well as overall satisfaction. For example, an American bank using a web site to promote services for French investors may want to avoid the use of the colour green, which some French may associate with criminality. On the other hand, the American bank may want to use green to attract Egyptian and Middle Eastern investors, as green has a positive connotation for them (Boor and Russo, 1993).

2.4.5 Metaphor

The Oxford Dictionary definition of a metaphor is the "application of a name or descriptive term or phrase to an object or action where it is not literally applicable". In this way, the metaphor is itself a semiotic sign providing meaning obtained from what is referenced. Researchers in HCI regard metaphors as the fundamental concepts, terms, and images by which information is easily recognized, understood, and remembered. (Marcus, 1998). Metaphors include the essential means by which choices for command / control are communicated and the status of all data and functions is depicted. Metaphors may achieve their effectiveness through associations of organization (structures, classes, objects, attributes, i.e., nouns) or operation (processes, algorithms, recipes, i.e., verbs).

Nielsen (2000) comments that metaphor can be useful for two reasons. First, a metaphor can provide a unifying framework for the design that will make it feel like more than a collection of individual items. Second, metaphor can facilitate learning by allowing users to draw upon the knowledge they already have about the reference system.

As with interface design, web designers are encouraged to use metaphors in their development (Henke, 1997). The ground has been prepared from years of interface design experience and developers have access to well-developed text and graphical tools. Even the terminology of the 'web' and 'browser' are metaphorical and make use of metaphor in the way they function. Web pages that use good

integrated metaphors have been shown to communicate better, facilitate performance and significantly reduce functional errors by those using it (Smilowitz, 2002). The same study suggests that "*The function labels (terminology) carries much of the weight in conveying the interface metaphor to the user, and therefore should be carefully chosen. It's not the pictures that are important, it is the metaphor, the semiotic sign, that improves the communication*". The significant emphasis on using metaphor to improve communication leads to a logical assumption that web site developers make extensive use of metaphor on the pages they build. A range of metaphors may be evident such as the cue-card, shopping basket / trolley/checkout, carton character/ anthropomorphic assistant and virtual experience. Optimum-web ltd also provides practical suggestions concerning metaphor issues for cross-cultural web development. Importantly the metaphor must be consistent with the users' knowledge of their world and this knowledge will vary across cultures.

Future research needs to explore further culturally diverse metaphors, their impact on communication, means of evaluating their effectiveness, and the process of designing them. To achieve successful communication simple, clear, consistent solutions will continue to benefit increasingly diverse information products for increasingly diverse international users.

2.4.6 Branding

According to *the American Heritage Dictionary of the English* (2000), *branding* is a trademark or distinctive name identifying a product or a manufacturer. Brands are not just names, terms, symbols, designs or combinations of these, although it is true to say that such things can and do differentiate certain products and companies from others. The additional ingredient that makes a successful brand is personality. Today's leading brands are personalities in their own right and are well known in all societies and cultures as film heroes, cartoon characters, sports stars or great leaders. In Asia, Coca Cola, Sean Connery, Nestle, Sony, Batman, Mercedes and Michael Jackson are equally well known. Thousands of people relate to brand personalities in the same way as they do to human personalities.

The secret to successful branding is to influence the way in which people perceive the company or product, and brands can affect the minds of customers effectively.

Successful global companies recognise that the source of their prowess in world markets is branding, and that investment in plant, technology and people is no longer enough to guarantee long-term sustainable profits (Temporal, 2000). Brand has become a vital strategic issue for Asian companies. In increasingly turbulent markets, brands are a key to customer loyalty, long-term survival and growth (Chernatony, 2001). The challenge facing the young dynamic companies of Asia is to build powerful global brands that will deliver long-term success for the nation, through good and bad times.

2.4.7 Trust and security

Trust is something that has to be earned over a period of time. In the real world, trust is gained both by observing the physical structure of the organisation as well as by third party recommendations. Trust brings in repeat business, an essential ingredient for success. *Security* is something that the businesses can strive to provide (Srinivsan, 2003). There are several tools available to enhance security on the Internet. For instance, Encryption, Public Key Infrastructure (PKI), Secure Socket Layer (SSL), and Secure Electronic Transaction (SET) are some of these tools.

Trust and Security are crucial factors that contribute to e-business success. There are many ways to build trust and improve security. Since e-businesses are accessible from anywhere at any time, there are additional impediments in building and maintaining trust and security. Trusting easy to use web sites, improving security for ongoing commitment and using third party referral service are crucial roles in electronic communications. Technology can be a solution but not the only solution in this effort.

2.5 Soft / user oriented issues

Although 'hard issues' are critical to effective localisation they are relatively well understood and experienced software localisation personnel can apply guidelines for design without too much difficulty. 'Soft' issues, on the other hand, are much more difficult to address and indeed form the main focus of this thesis.

Soft issues refer to those that focus on the ways in which people in different cultures interact with, and respond to web sites. These underpinning cognitive and cultural dimensions of culture may have major implications for the process of international web site design.

Within the human-computer interaction (HCI) field there is general agreement that that soft / culture related issues influence interaction. The problems are how to study culture effectively in order to measure and to specify such differences in order to address the needs of users world-wide.

To do this, this thesis will first look at what is culture, its layers of issues that could possibly influence product design, then some well known cultural models and their impact on web site design will be investigated.

2.6 Exploring culture

In western language, 'culture' commonly means 'civilisation' or 'refinement of the mind' and in particular the results of such refinement like education, art and literature. Culture has been defined in many ways and there is no agreement to a specific definition of culture. In 1952, for example, Kroeber and Kluckhohn reported over 300 definition of culture that they found in the anthropology literature. Kluckhohn (1951) quotes as a consensus of anthropological definition:

> "*Culture consists in patterned ways of thinking, feeling and reacting, acquired and transmitted mainly by symbols, constituting the distinctive achievements of human groups, including their embodiments in artifacts; the essential core of culture consists of traditional (i.e. historically derived and selected) ideas and especially their attached values.*"

Culture has been regarded as 'mental software'. (Hofstede, 1991). Hofstede (1982) treats culture as the collective programming of the mind which distinguishes the members of one human group from another. Culture is always a collective phenomenon, because it is at least partly shared with people who live or lived within the same social environment, which is where it was learned. Culture is learned, not inherited. It derives from one's social environment, not from one's genes.

Honold (2000) defines culture for the purpose of human computer interaction, on the basis of definitions provide by definition of other researchers, as following:

- Culture defines members of a group as distinct from members of other groupings.
- Culture creates an orientation system and a field of action for these members.
- Culture manifests itself in cultural models. These may be internal cognition of external artefacts and institutions.
- Cultural models may be differ in their scope and therefore in their significance to a culture.
- Culture models are acquired through interaction with the environment. Action and experience on the one hand and cultural models on the other affect one another through the processes of accommodation and assimilation.
- Culture does not determine the behaviour of individuals but it does point to probable modes of perception, thought and action. Culture is therefore both a structure and a process.

2.6.1 Cultural meta models

A cultural model helps to identify levels of issues involved in this complex problem by using *international variables, or dimensions of culture.* International variables are categories that organise cultural data. There are three meta modals of culture that were reviewed by Hoft (1996), the iceberg model, the pyramid model and the onion model.

The *iceberg model* is a popular meta model that is often used in cross-cultural research. Figure 2.1 illustrates the iceberg models. The analogy drawn in the iceberg model is that just as 10 percent of an iceberg is visible above the surface of the water, only 10 percent of the cultural characteristics of a target audience is easily visible to an observer (us). It follows that just as the remaining 90 percent of our cultural characteristics are hidden from view and are therefore easier to ignore and more difficult to identify and study.

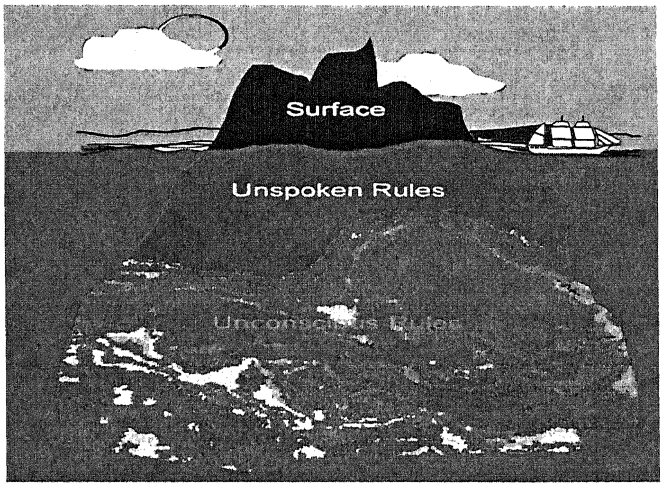


Figure 2.1: The iceberg model for culture

The model identifies three metaphorical layers of culture. The surface layer includes visible, obvious rules such as number, currency, time and date formats. Unspoken rules are obscured and need the context of situation to understand the rules. Unconscious rules are rules out of conscious awareness and are difficult to study.

Another model that is well known was developed by Geert Hofstede was called the *pyramid model.* (Figure 2.2). Hofstede introduces three layers of culture in Pyramid model: personality, which is specific to a person and is learned and inherited; culture, which is specific to a group or category of people. It is learned not inherited and human nature, which is common to all human beings. It is universal and is inherited, not learned.

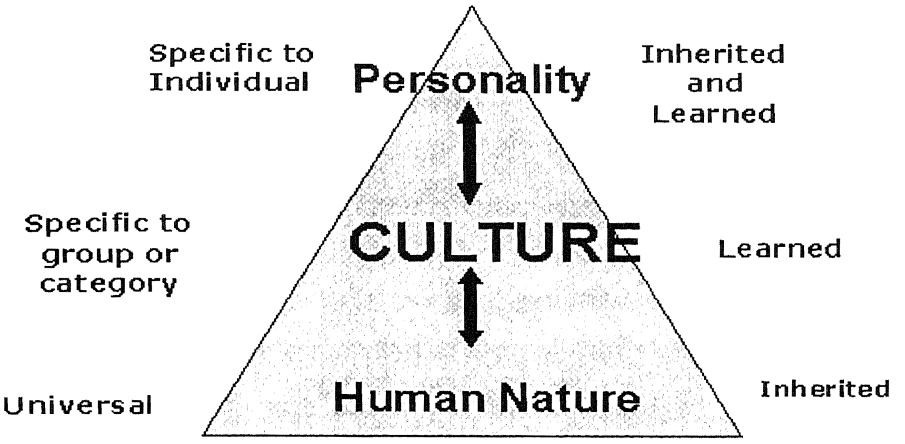


Figure 2. 2: The pyramid model for culture

Trompenaars' *onion model* (1997) provide us with a sense of which layer of culture we would like to look at to test international computer products. (Figure 2.3).

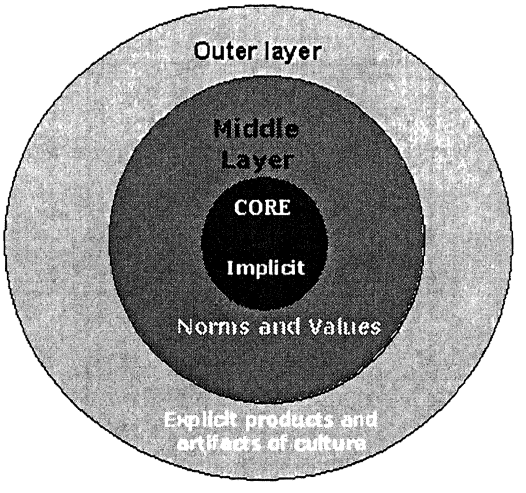


Figure 2.3: The onion model for culture

Overall these models are all telling us one thing: culture has multiple layers and what we can normally observe is only the most external layer which counts for

about 10% of its total influence. There is much more profound influence of which we may not even be aware. The Iceberg Model and the pyramid model are most helpful to illustrate this point.

2.6.2 Culture variables and some known cultural studies

Cultural variables give valuable insight into dimensions of human cultural activity that can assist in the interpretation of cultural data. Cultural variables measure the degree of belonging to a certain culture or subculture. The choice of cultural variable to be adopted will depend on the data available and the task to which it will be put. A variety of cultural variables have been summarised by Darlinton (1996) are shown in Table 2.2.

Table 2.2: Comparison of cultural variables

	KLUCKOHM AND STRODTBECK (1960)	HALL (1959, 69,76)	HOFSTEDE (1984, 1991)	TROMPENAARS (1997)	MAZENVSKI (1994)
Human Nature	Good, Evil, Neutral, Mixed Changeable unchangeable	Agreements	Uncertainty Avoidance	Universalism Particularism	Good, Evil Changeable
Relation to nature	Subjugation Harmony Mastery	_____	Uncertainty Avoidance	Internal: External Orientation	Subjugation Mastery Harmony
Activity orientation	Doing Being, Being-in-becoming	Monochronic Polychronic (interacts with individualism)	Masculinity	Achievement: Ascription	Doing, Being, Containing and Controlling (Thinking)
Human Relationships	Individual Collective Hierarchical	Amount of Space, Possessions, Friendship, Communication	Power distance	Equality Hierarchy Individualism Collectivism Affective Neutral	Individual Collective, Hierarchical
Relation to Time	Past, Present Future	Past, Future	Long time Orientation	Sequential Synchronic Past, Present future	_____
Space Orientation	Public Private Mixed	Public Private	_____	_____	_____

Such cultural models compare the similarities and differences between two or more cultures by using variables to organise cultural data (Hoft, 1996). By

investigating to what extent a target culture can be described in terms of these cultural variables, a descriptive profile of the culture can be developed.

After examining hundreds of cultures, Kluckhohns and Strodtbeck (1960) reached the conclusion that people turn to their culture for answers to the following five questions:

(1) What is the character of human nature?

(2) What is the relation of placed on activity?

(3) What is the orientation toward time?

(4) What is the value placed on activity?

(5) What is the relationship of people to each other?

The answers to these crucial questions serve as the bases for the five value orientations that are at the heart of their approach. These five orientations (human nature, relationships of humankind to nature, sense of time, activity and social relationship) might best be visualised as points on a continuum.

Hall (1959,1969,1976) offers us another effective means of examining cultural similarities and differences in both perception and communication. He categorises cultures as being either high or low context, depending on the degree to which meaning comes from the settings or from the words being exchanged. The study of high-context and low-context cultures offers us some insight into what people pay attention to and what they ignore. Figure 2.4 shows the Cultures arranged along the High-context and Low-Context Dimension.

Context is "*the information that surrounds an event, it is inextricably bound up with the meaning of event*" (Hall, 1976). A high context (HC) communication or message in one in which most of the information is already in the person, while very little is in the coded, explicitly transmitted part of the message. A low context (LC) communication is just the opposite, i.e., the mass of the information is vested in the explicit code.

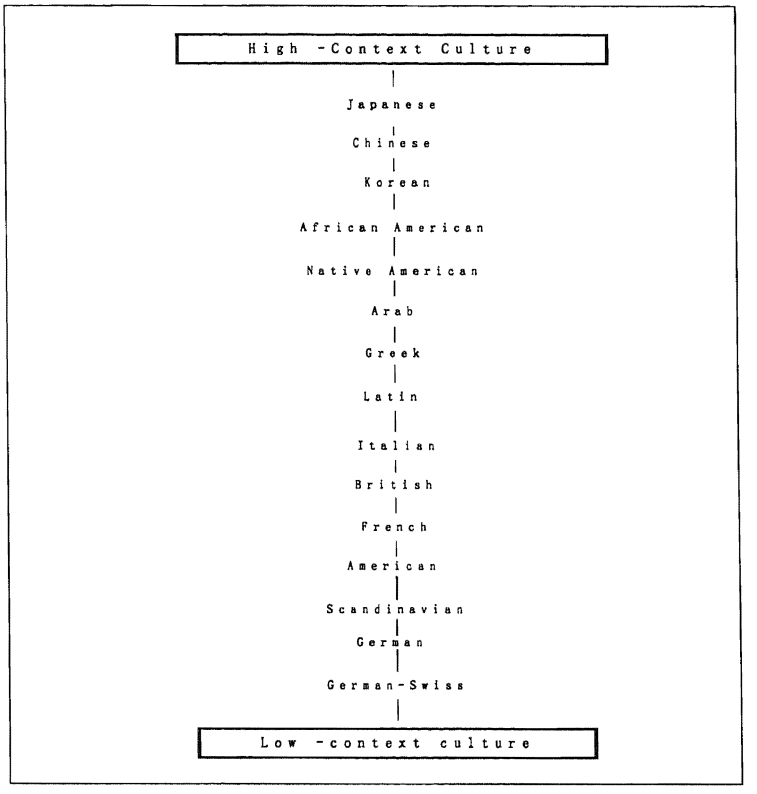


Figure 2.4: Cultures arranged along the high-context and low-context dimension

In high–context cultures, people are very homogeneous with regard to experiences, information networks and the like. High–context cultures, because of tradition and history, change very litter over time. These are cultures in which consistent messages have produced consistent responses to the environment. In high-context cultures, meaning is not necessarily contained in words. Information is provided through gestures, the use of space, and even silence. Meaning is also conveyed "*through status (age, sex, education, family background, title, and affiliations) and through an individual's informal friends and associates*" (Hall, 1976). In low context cultures, the population is less homogeneous and therefore tends to compartmentalise interpersonal contacts. Hall said this lack of a large pool of common experiences means that *"each time they interact with others they need detailed background information*" (Hall, 1976). In low-context cultures, the

verbal message contains most of the information and very little is embedded in the context or participants. This characteristic manifests itself in a host of ways. Members of low-context cultures expect messages to be detailed, clear-cut, and definite. If they are not enough data, or if the point being made is not apparent, members of these cultures will ask very blunt, even curt, questions. They feel uncomfortable with the vagueness and ambiguity often associated with limited data.

Another problem is that people in high-context cultures perceive low-context people, who rely primarily on verbal messages for information, as less credible. They believe that silence often sends a better message than words, and anyone who needs words does not have the information. Deference in this communication dimension can even alter how conflict is perceived and responded to. The communication differences between high-context and low-context culture are also apparent in the manner in which each approach conflict. (Ting-Toomey, 1997).

Approaches to time orientation are also significant within cross-cultural differences. Time is embedded so firmly in human's life that people treat it as one of the most fundamental dimensions of life, similar to our attitudes about interpersonal space. One key aspect of time is related to people's behavior in terms of time usage. (Hall, 1959). When people perform multiple tasks, some use a serial approach whereas others do many things at once (in parallel). Hall (1959) first distinguished these two behaviors as monochronic and polychronic behaviors. Monochronic behavior or monochronicity is doing one thing at a time, and polychronic behavior or polychronicity is doing many things at a time. The monochronic person always schedules tasks and they permit only a limited number of events within a given period. For a polychronic person, there is little or no effect when things are constantly shifted around. Nothing seems solid or firm, particularly plans for the future, and there are always changes in the most important plans right up to the very last minute. Society organizes time in everyday life in one of these two ways and the behaviors may be learned within the society. Thus, people belonging to different cultures may exhibit different

types of behaviors in relation to time orientation.

Victor's LESCANT model (1992) provides yet another view of culture and offers a rich array of variables. A central theme in Victor's work is that cultural differences and similarities are essential to, and inseparable from, effective international business communication. LESCANT is an acronym based on words in English, each of which is an international variable that is briefly described as following:

Language refers to degree of fluency, accents and regional dialect and how they affect business communication, and about linguistic determinism.

Environment and technology consider large issues such as the ways in which geography, population, concepts of physical space, and perceptions of technology affect business communication.

Social organization explores educational, economic, social, political and religious system as they affect business communication.

Context expands on Hall's model of context, and ranked cultures using Hall's context square.

Authority conception considers differences and similarities in power, authority and leadership, how they are perceived differently in cultures, and how this perception affects business communication.

Nonverbal behavior is a broad category for many types of nonverbal behaviors, and Victor divides them into active and passive behaviors.

Temporal conception explores various perspectives of time, and how they can affect business communication, particularly with respect to scheduling.

Trompenaars (1997) researched value dimensions and his work was spread over a 10-year period with 15,000 managers from 20 countries representing 47 national cultures. He developed international variables similar to those proposed by Hofstede, which are described below. In particular he identified the dimension of *achievement versus ascription*, which relates to the derivation of personal status, be it from background or achievement, it is of interest in the context of this enquiry, as perceptions of quality may be influenced by ascriptive associations,

such as brand name and they could influence results.

In relation to learning styles, field-dependency is a further factor that varies across cultures (Engelbrecht and Natzel, 1997) and this may effect cross-cultural usability. Field-independent individuals tend to be more analytical, impose their own structuring more on a situation, and are relatively less passive and global in their behaviour (Ford et al., 1994).

In spite of a wide range of research, Hofstede's (1991) dimensions of culture are the most often quoted cultural variables in relation to cross-cultural usability. He conceptualised culture as '*programming of the mind*', in the sense that certain reactions were more likely in certain cultures than in other ones, based on differences between basic values of the members of different cultures. Hofstede carried out a study of 116,000 IBM employees distributed through 72 countries using 20 languages in 1968 and 1972. The study was based on a rigorous research design and systematic data collection. He proposed that all cultures could be defined through the following dimensions:

Power-distance (the degree of emotional dependence between boss and subordinate);

Collectivism vs. Individualism (integration into cohesive groups versus being expected to look after him/her self);

Femininity vs. Masculinity (which could be interpreted as toughness versus tenderness);

Long-term vs. Short term orientation (which represented a philosophy of life that was prepared to sacrifice short-term results for long-term gain);

Uncertainty avoidance (the extent to which members feel threatened by uncertain or unknown situations)

Marcus and Gould (2000) make detailed use of Hofstede's work provides web developers with significant suggestions, in order to develop sets of guidelines so as to produce successfully localised software and web sites. The detail of Hofstede's five variables will be introduced in the following chapters.

A closely related concept to Hofstede's individualism-collectivism dimension is Rotter's (1966) *locus of control* (LC) which refers to whether individuals tend to feel that events are the result of their own actions (internal locus) or the effect of the external environment and powerful others (external locus). It has been suggested that locus of control influences information-seeking behaviour so that 'internals' seek more information in problem solving, although the strength of this behaviour depends very much on the situation. In contrast when individuals adopt an external approach they might not generalise or learn effectively. They learn less because they believe they do not control the relationship between their behaviour and reinforcement. It has been hypothesised that 'externals' would suffer depression and anxiety as a result of poor achievement outcomes whereas 'internals' would exhibit more 'painful' behaviour. For example in Western cultures the making of plans and having them work is frequently endorsed, while in collectivist societies the focus is less on having plans work well, but more upon personal relationships and the causal reasons for not doing well in them. This can have many effects including the belief a person has in his or her ability to accomplish computer tasks (Langford and Reeves, 1998).

2.7 Shared meanings and semiotics

2.7.1 Basic concepts of Semiotics

An implicit assumption behind this work is the proposition that traditional software and information systems development methods of analysis design are not fully adequate for identifying the requirements for usable cross-cultural web sites.

It has been suggested that web site localisation and globalisation activities can be successfully informed by relevant theoretical paradigms such as *semiotics* - the science of signs and shared meanings (French and Smith, 2000). More specifically semiotics is the discipline that connects meaning, meaning making, communication and culture through an understanding of acts of signification

(Peirce, 1973; Saussure, 1974; Andersen, 1990). It is suggested that signs pertaining to our senses (visual, aural, oral, tactile, and even olfactory) underpin HCI activities. Semiotics focuses on signs and sign vehicle processes, therefore it offers a sound theoretical basis for which practitioners can use to manage, design and build adaptive and commercially exploitable WWW solutions.

Semiotics involves the study not only of what we refer to as 'signs' in everyday speech, but of anything which 'stands for' something else. Semiotics focuses on the ways producers create signs and the ways audiences understand those signs. (Littlejohn, 1999). A significant amount of classical semiotic theory revolves around the use of language with a particularly strong literary focus coming from the work of Ferdinand de Saussure. Saussure who offered a 'dyadic' or two-part model of the sign. He defined a sign as being composed of: a 'signifier (the form which the sign takes) and the 'signified' (the concept it represents). The relationship between signifier and signified is showed in Figure 2.5.

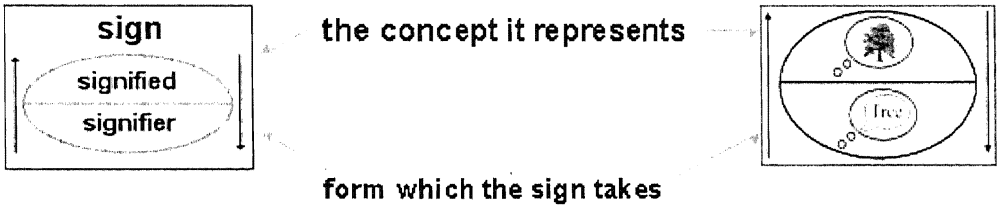


Figure 2.5: Relationship between signifier and signified

A sign must have both a signifier and a signified. Signified is regarded as a mental construct, the signifier is commonly interpreted as the material (or physical) form of the sign. It is something that can be seen, heard, touched, smelt or tasted. Saussure identified that different languages use different words for the same thing and that an object and the word for that object usually have no physical connection. For example, the word 'computer' has no physical resemblance to an actual computer but is an arbitrary 'sign' representing it (Littlejohn, 1999) Saussure differentiates between the sign (or signifier) along with what it denotes (the signified), and these two component parts are considered separately (Everard,

1997).

There are three main categories of sign: icon, index and symbol. Any particular sign may contain elements of all of them. A *symbol* (signified and signifier) has an arbitrary connection, so that the relationship must be learned. An *icon* (a mode in which the signifier is perceived as resembling or imitating the signified) is recognizably looking, sounding, feeling, tasting or selling likes it. The *index* is where the signifier and signified are bonded together through physically or causal relationship -this link can be observed or inferred.

Another important figure in classical semiotic theory is Charles Saunders Peirce who defined semiotics as a relationship among a sign, an object, and a meaning (Littlejohn 1999). The sign represents the object, or referent, in the mind of an interpreter. Peirce referred to the representation of an object by a sign as the interpretant. For example, the word tree is associated in the mind with a certain type of plant. The word is not the plant, but the association made (the interpretant) linking the two. All three elements are required in a three-way relationship in order for signs to operate (Littlejohn, 1999).

Semiotics is the discipline that connects meaning, meaning making, communication and culture through an understanding of acts of signification. Computer-based *signs* in this context include textual cues, images, icons, and sounds. There are a variety of semiotic discourses and traditions, and there have been similarly various recent attempts to apply semiotic principles to the design of user interfaces (French and Polovina, 2002). Semiotics does not recognise that any particular sign (e.g. on-line brand sign) is truly 'universal'. It all rather depends on the context: both local and global. Previous studies have tried to define and quantify the difference between a sign and its meaning (Blankenberger and Hahn, 1991) without much success. This 'failure' is not however surprising, since it is due to a fundamental semiotic principle: that both the *context of the sign* and the *interpretant of the sign* alter the *meaning* of the sign itself. This field of semiotics, therefore, implies that signs and their meanings (semiosis) will vary as between users from different cultures.

2.7.2 Semiotics and usable web sites

Some semiotic ideas have been shown to hold potential to contribute to ~~a~~ design frameworks such as SMDF (Vile, Polovina and French, 2000) for web site design. It is claimed that by adopting a semiotic perspective we are able to more carefully examine the computer based signs and their cultural and semantic bindings as instantiated in a cross-cultural web site artefact. The central notion of semiotics is that users give meanings to a set of computer based signs, that this process of meaning making (called semiosis) is infinite, but strongly influenced by a user's cultural and social context of use. Each semiotic element (sign or text), can be read in any number of ways other than that intended by the designer. Texts and signs offer statements at a level of power, solidarity and ideology. Web sites might exclude certain groups by being gender specific or culturally biased.

French and Smith (2000) suggest that in order to gain a deeper understanding of web sites that are optimally matched to both their target audience and domain (e.g. e-finance, e-commerce) it is possible to investigate the different signs in a local culture. Here it is necessary to investigate their context of use, and the meanings that the locals attribute to them. French, Mincoch and Smith (2002) show how this can be achieved by conducting an audit of local indigenous sites. Typically, an audit would be carried out by a usability expert who belongs to that target culture, or has a good understanding of that culture via first-hand personal experiences, or through extended family or friends. The audit would involve evaluating prominent and successful local web sites that are considered to be typical exemplars in the domain of interest or in related domains, with a view to identifying the use of specific *cultural attractors*. Further detail will be discussed in Chapter 7.

2.8 Research in cross-cultural web site usability and acceptability

As we travel and meet different people we realise that people are very different

and have different cultural characteristics. These cultural differences will raise a question whether present day usability evaluation methods predominantly developed in the West (North America and Europe) are appropriate for international user experience and evaluation of software. The issue above also raises the point of user centred design process and user data analysis for different cultures. Nielsen (1990) and Fernandes (1995) have cautioned that results of usability tests, conducted in the software's country of origin, may not be valid internationally. The software must be tested in the target market to ensure that software is acceptable and does not cause an offence to target community. The usability evaluation methods outcome will be depended on the cultures in which the methods are used. For example, Fernandes (1995) has given some problems that are faced with these methods when used in different cultures. The cultural differences in different regions will have different effect on the methods.

There has been a considerable amount of academic research going on in the field of cross-cultural usability throughout 1990's. Badre and Barber (1998); Boor and Russo (1993); Khaslavsky (1998) focused on measuring attitudes towards technology, conceptual software design and translation respectively.

Other researchers have carried out cross-cultural usability studies on specific cultures. For instance, Yeo (2000) conducted a study on cultural effects in usability assessment for Malaysian culture. Yeo used the 'think-aloud' and the interview methods to identify factors that may affect results of usability evaluation techniques in Malaysian culture. Day and Evers (1999) developed a questionnaire to access cultural factors in the acceptance of computer interfaces. They also examined the differences of cultural influence between Austrian and Asian users toward interface design preferences and on the attitude towards software technology. They concluded that the acceptance process towards software technology flows different between cultures. For an effective implementation of machine localisation for China, Rose, Liu and Zuhlke (2001; 2002) proposed a three-level model, which classified the machine localisation design issues into three localisation levels (surface, interaction and function) with different

localisation efficiency. They concluded that for an effective implementation of machine localisation for Mainland China it is not only necessary to address the culture-specific user requirements in machine design, but also necessary to well manage the localisation cost and effect to achieve best localisation efficiency.

Cultural differences such as those described in earlier Sections of this Chapter are potentially relevant to both the design and the process of web site design. Badre and Barber (1998) refer to the merging of culture and usability as 'culturability' when cultural elements are considered in web site design, and are expected to directly effect the way a user interacts with the site. Indeed, it is widely recognised that cross-cultural attitudes (Sensales and Greenfield 1995) and perceptions should be taken into account in the development of software and user interfaces (e.g. del Galdo and Nielsen, 1996; Fernandez, 1995; Kellogg and Thomas, 1993; Nakakoji, 1994; Evers and Day 1997; Evers, 2002).

Much of the work in this area has focused on Asian and Western perceptions and little work appears to have been done investigating perceptions of cultures that have recently joined the global community of the Internet (El Saiid and Hone, 2001). Cross-cultural web usability development has the opportunity to provide competitive advantage when entering an international market with a software product or web site. In 2000, Nielsen commented:

> *'As the web becomes ever more international, it becomes more and more important to pay attention to international usability [...]. Eventually, international usability will be a requirement for success on the Internet.'*

An underlying premise is that when web site visitors are more comfortable with design and usability features they will be more likely to experience satisfaction and revisit the site. (Cyr et al, 2003). However, in studies in which cultural preferences related to usability are examined, results have been mixed. For instance, Badre (2000) tested Italian participants using Italian designs and found preferences for navigation but not for colour. In the same study, there were no

significant differences as a result of varying cultural characteristics for Americans. Further, Simon (1999) examined cultural differences in perception and satisfaction among Asia, Europe, Latin and South America, and North America based on Hofstede's model. He found different preferences for colours and navigation.

Hofstede's work has been influential in research in information systems development (e.g. Merrit and Hemlreich, 1996). Rathod and Miranda (1999) found evidence that high power distance produced high emotional dependence but low task dependence for Tele-working. In relation to the design (artefact) itself the cultural dimensions can lead to design guidelines. Marcus and Gould (2000), for example, address Hofstede and present guidance for each of Hofstede's dimensions based on a theoretical analysis of web sites.

A number of characteristics contribute to the user experience of a web site including the presence of flow, credibility, and cultural sensitivity to user preferences. These characteristics could contribute to effective design, and ultimately to user experience. However in most cases these proposed elements of design have not been subjected to empirical testing across cultures. Simon (2001) and Yoon (2002) found quality of web site design to result in user web site satisfaction. Simon also found that web site characteristics contribute to user's web site perception. Relevant to the current research, Cyr et al (2003) suggest that across cultures design preferences differ as they contribute to web site satisfaction and web site perception.

Smith and Dunckley (1998) have also reported a low rigorous experimental design strategy called LUCID (Logical User Centred Interface Design), which provides a framework for design whereby well established tools and techniques can be integrated with Taguchi methods within a user-centred approach to optimising the usability of the HCI, which can be used within cross-cultural web usability. LUCID investigated relationship that might exist between cultural factors of end users and user performance satisfaction, used cultural dichotomies

as end-points of various dimensions on which users differ in order to increase the efficiency of web usability (Dunckley and Smith, 2000).

Chen and Yeh (2000) introduced interaction design concepts pertinent to the application of human factors analysis in order to facilitate the process of localisation; Aoki (2000) discusses the results of a content analysis of the top 50 popular web sites in U.S, the study examined cultural differences in the use of the Web in each country and suggested strategies for global e-commerce. Through an international user experience study evaluating a virtual campus web site, Evers (2002) suggested that different real world experience and differences in ideas indeed influence user understanding and behaviours as well as influencing navigation and information search strategies.

A vast body of cross-cultural web usability research also have been carried on by industry. Marcus and Gould (2000), for example, proposed his solution to global interface design on the web consisting of partially universal and partially local solutions to the design of metaphors, mental models, navigation, appearance and interaction. Lozier (2000) and Nielsen (2000) also provided several general principles or guidelines for cross-cultural web usability / acceptability. Jakob Nielsen has also offered substantial and continuing guidance (Nielsen and Tahir, 2002; www.useit.com) on improving usability in interface design. Nevertheless, issues concerning the quality of web pages also merit attention as these relate to the ability of the page to satisfy the requirements of the web user (and hence, the author).

More and more articles have appeared in conference proceedings and publication of professional organisations. Examples of these organisations include the Association for Computing Machinery's Special Interest Group on Computer-Human Interaction (ACM/SIGCHI), the International Conference in Human Computer Interaction (HCI International), the Usability Professionals Association (UPA) and International workshop on Internationalisation of Produces and

Systems (IWIPS), all of which have had technical sessions, panels, and theme publications devoted to globalisation and user interface design.

Today, the web developers' community is becoming increasingly aware of the need to acknowledge cultural variables in web development, as one might deduce by the growing number of academic and technical publications on this matter. Also, this can be concluded by the growing emergence of software globalisation companies on the Web. Despite these initiatives, much more specific Asia-Pacific intra and cross-cultural work (both empirical and theoretical) is needed to explicate regionally specific issues. For example, there is still no generally agreed set of design guidelines for localising or globolising web-content between APEC members and the UK.

The literature review indicates that there is no lack of theoretical underpinning for cross-cultural usability and acceptability. However, there is a lack in explicit demonstration that such theories of culture are actually applicable to, and significant within, web site usability/ acceptability. Based on previous classical theories and researches, investigation with British and Chinese web users will be carried on, to explore the differences and similarity, which may exist between generic cultural factors and specific implementation in the cross cultural web environment.

Summary

This Chapter has:

- Reviewed theoretical background to, and associated research underpinning web site user acceptance;
- Focused on definitions of usability and acceptability;
- Identified two broad types of usability / acceptability issues that inherent in international web site design;
- Presented a discussion of theoretical models of culture and relates these to the semiotic paradigm as these are the two core theories underpinning the eCulture project;
- Outlined some key and relevant research in cross-cultural web site usability and acceptability.

Chapter 3

Methodology

Chapter objectives

This Chapter aims to present the overall research methodology adopted in the eCulture: UK and China project. It discusses the top-down and bottom-up approaches implemented, and provides a very brief overview of each of the 7 main studies that constitute the whole project. Finally, a briefly introduction of Taguchi method, and how to integrate Taguchi methods for experimental design and statistical analysis in cross-cultural web acceptability research is provided.

3.1 Research Framework

Three key objectives for the eCulture: UK and China research project were established in Chapter 1.

1. To ascertain the extent to which there are genuine differences in acceptability requirements between UK and Chinese users.
2. To explore, categorise and measure the characteristics of such differences.
3. To relate such differences to the web site design process so as to provide guidance to web site developers in order to build usable sites in the Chinese context.

The research framework that was adopted to achieve these aims consists of two main frames of approach as shown in Figure 3.1. Both top-down and bottom-up empirical studies have been implemented to investigate differences in web site usability and acceptability, user cognition, and shared meanings between users from Mainland China and the United Kingdom.

In cognitive theory, (Marr, 1982; Fodor, J. 1983; Langton, 1989) a bottom-up

method involves starting with concrete, low-level abilities (sensory and motor ones) and trying to move up to an explanation of the rest of our behavioural and cognitive abilities on the basis of the low level abilities. In general, bottom-up approaches tend to be concrete, sensory (visual, auditory), motor and neural. In contrast, top-down methods are the reverse. They start with abstract, high-level abilities (like language and reasoning) and try to move down to an explanation on that basis of that. In general, top-down approaches tend to be abstract, symbolic and computational, and are best suited to high-level of cognitive skills.

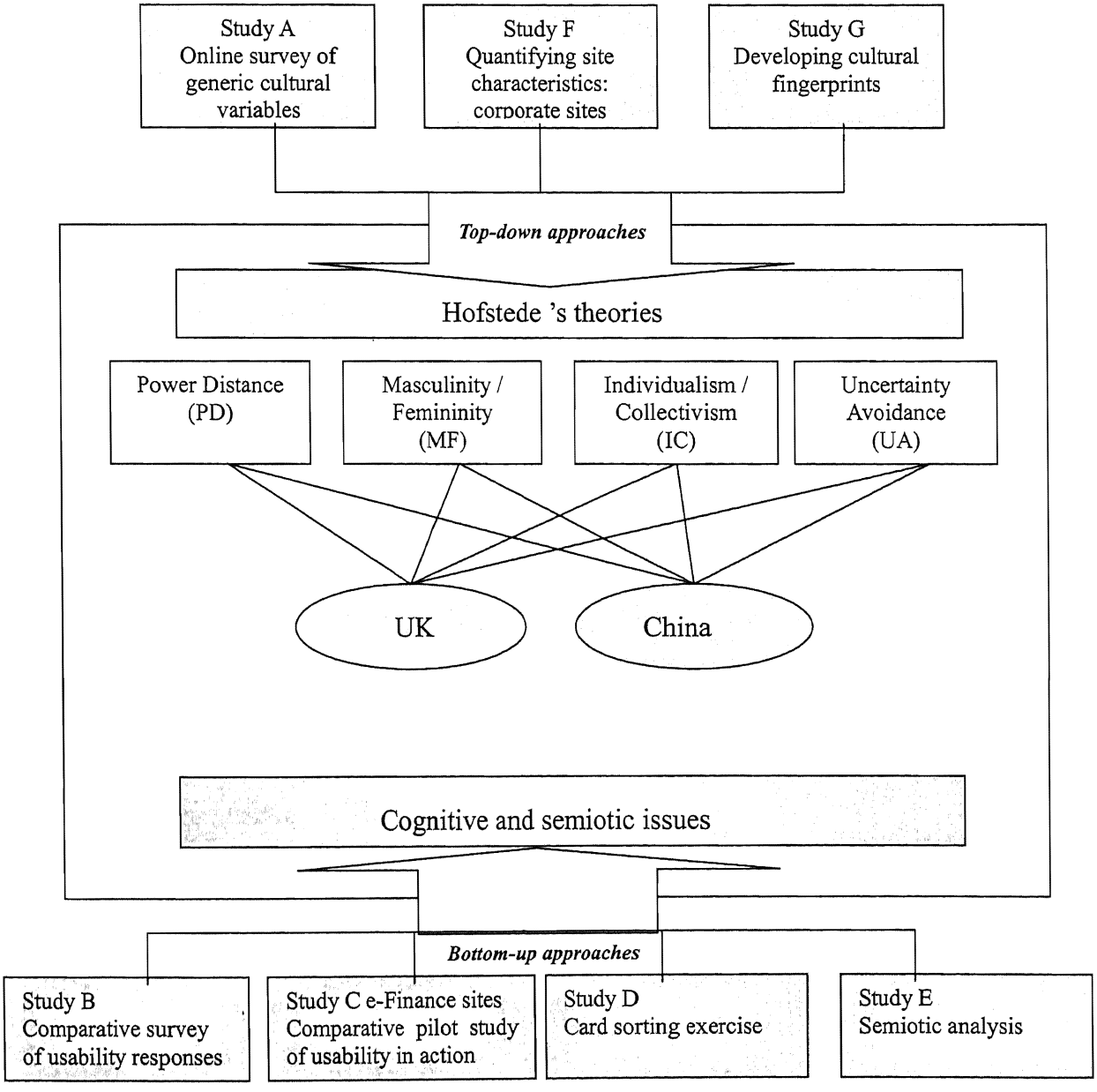


Figure 3.1: Pictorial representation of the research methodology

In many computer development tasks, designers often talk about top-down and bottom-up solutions to their problem (Leith, 1984). Bottom-up designers search for generic tools, or libraries, that may prove useful in the solution to more complex problems. Often this type of design is performed implicitly, but recognising its importance emphasises the data types that may be useful in the program's design. In many engineering tasks, designers also use top-down methods as solutions to their problem. In a top-down design, an engineer would provide a short summary of the problem and solution, and identify each significant subtask. The next step is to try and solve each subtask individually, and these in turn may be broken down into sub-subtasks. Overall, a hierarchical structure is constructed such that each module solves a small part of the original program. This is probably the most obvious paradigm for encapsulating details into well-defined blocks and finally solving the problem (Hilburn, 1993; Budd, 1994).

In this thesis, bottom-up approaches have been used for detailed investigations of the differences in web site usability, cognition, shared meanings and acceptability between users from Mainland China and the United Kingdom. In contrast, top-down approaches have been implemented to investigate the significance of classical culture theories to web site acceptability through experimental design, user testing, and data analysis. The aim has been to verify classical culture models and construct real cultural fingerprint for the target culture.

3.2. The studies

In total this thesis draws on the results of seven independent research studies. These projects have been undertaken in both the UK and China in the period 2000 to 2003. The studies are labeled Study A to Study G in the order in which they are presented in the following chapters in this thesis.

3.2.1 Top-down approaches

Within the eCulture: UK and China project three top-down studies have been completed:

Study A: Online survey of generic cultural variables

Aim: This study aimed to provide an indicative study to investigate the degree to which generic cultural variables (such as Hofstede's dimensions) are evident in today's society.

Methodology: An online survey based upon the original Hofstede questions was undertaken with British, Greek and Chinese people. Although there are limitations in the approach this initial study was undertaken in the UK. Analysis involved using general statistic data analysis to derive conclusions.

Comments: Study A: Survey of Generic Cultural issues is presented in Chapter 4.

Study F: Quantifying site characteristics: corporate sites

Aim: This study involved analysing user responses to corporate sites in order to validate Hofstede's cultural factors in the context of both UK and Chinese web users.

Methodology: This study involved a partial factorial experimental design strategy based upon Taguchi methods.

Comments: Study F: Quantifying site characteristics: corporate sites is presented in Chapter 8.

Study G: Developing cultural fingerprints

Aims: This study involved constructing 'cultural fingerprints', which are proposed as a diagrammatic representation of the significant characteristics of culture.

Methodology: Two versions of cultural fingerprints are constructed on the basis of Taguchi experimental design, expert evaluation and ANOVA analysis. From empirical research conducted in China, a revised version of fingerprint for Chinese users has been constructed.

Comments: There are three key advantages for cultural fingerprints:

(a) they provide a diagrammatic means of representing and communicating culture in the context of web site acceptability;

(b) the process involves quantitative methods to document cultural factors;

(c) through the comparison of real site fingerprint and the target cultural fingerprint, the web designer could easily find what he or she could modify the design to fit the target culture.

Study G: Developing Cultural Fingerprints is presented in Chapter 9.

3.2.2 Bottom-up approaches

Within the eCulture: UK and China project four bottom-up studies have been completed:

Study B: Comparative survey of usability and Internet development responses

Aim: To investigate differences in response to usability issues between Chinese and British web site users.

Methodology: A survey previously implemented by commercial organisations (optimum.web / Accenture) in the UK was replicated in China. General statistical data analysis methods were implemented to derive conclusions.

Comments: In China studies were undertaken in the cities of Beijing, Dalian and Kunming. The Study of generic cultural issues is presented in Chapter 5.

Study C: Comparative study of usability in action – pilot study in eFinance

Aim: The aim of the first / pilot study in online usability testing was to explore potential differences in perceptions and preferences for web sites between UK and Chinese users.

Methodology: The methodology again replicated a study undertaken by commercial organisations (optimum.web / Accenture). The specific method involved the use of a partial factorial experimental design method in order to determine the importance of different web site design features for the two user

groups. Further social semiotics analysis was implemented to derive conclusions.

Comments: Study C: Pilot Study of eFinance web sites is presented in Chapter 5.

Study F: Card Sorting Exercise

Aim: This study aimed to analyse user perceptions of web site home pages.

Methodology: This study used card sorting as a tool for investigating comparative cognitive and cross-cultural web acceptability issues between Chinese and British users.

Comments: Study F: Card sorting exercise is presented in Chapter 6.

Study G: Semiotic Analysis

Aim: The *Semiotic Analysis study* aimed to provide a supplemental way of eliciting cross-cultural acceptability by focussing on the meanings that an interface (intended and unintended) transmits.

Methodology: The study provided an effective way of exploring the core features of a web site by checking whether typical indigenous web sites are semiologically valid, engender trust and security, and are culturally suitable. Semiotic analysis of web sites is able to reveal local cultural dynamics.

Comments: The strength of semiotic analysis lies in its ability to relate specific site content to wider and often dynamically changing consumer behaviours and wider cultural phenomena.

Study G: Semiotic Analysis is presented in Chapter 6.

3.3 Taguchi method (experimental design and statistical analysis)

Several of the studies discussed later in this thesis implement Taguchi methods as a tool to facilitate experimental design and statistical analysis. This section provides an overview of Taguchi methods.

Taguchi's work in Total Quality Management (Taguchi, 1986; 1994) bases the quality improvement of products and processes on concepts of optimisation through the design of experiments where key factors are investigated by a set of experiments using orthogonal arrays. Fractional factorial experiments are used to simplify the investigation by looking at only a fraction of all the possible experiments (in this case refers to user tests).

3.3.1 Overview of the Taguchi method

Taguchi methods were developed by Genichi Taguchi to improve the implementation of TQM (Total Quality Management) in Japan and their use has spread to both the USA and Europe. His ideas for TQM fall into two principal and related areas known as the *loss function* and *off-line quality control* (Dale and Plunkett, 1990). Taguchi methods are also called robust design in the U.S.A .The majority of the applications of Taguchi methods are within production control where he defines the quality of a product to be *'the loss imparted to society from the time the product is shipped'*. Among the losses, Taguchi includes consumers' dissatisfaction, warranty costs, loss of reputation and loss of market share. In order to investigate quality, a quality characteristic (e.g. strength) is identified and losses occur not only when a product is out of a permissible range for the quality characteristic, but also when it deviates from its target value. *Quality* as defined by Taguchi is achieved by minimising deviation, rather than mere conformance to specification. As a result emphasis is given to off-line quality control. Here the concern is with the process of optimising production processes and product factors (such as the quality of materials, or the temperature of production) in such a way as to minimise item to item variation in the product and performance. Underlying the Taguchi method is the concept that quality is affected by two types of factor: internal or *control* factors (such as materials) which can be controlled easily, and external or environmental *noise* factors (such as maintenance of equipment) which cannot be controlled easily. Roy (1990) summarised Standard Taguchi procedure as shown in Figure 3.2. The following is a brief description of each phase:

I. Planing (brainstorming). Formally, this is the experiment planing session, the basic concept is for the design team to agree on the quality characteristic, which would be a yardstick for measuring the performance of the product or process under study. The quality characteristic can be single criterion such as pressure, temperature, efficiency, hardness, or a combination of several criteria together into a single index. It is necessary to consider the nature of the performance objectives such as *bigger is better*, *smaller is better* or *nominal is the best*. All those involved should aim for group consensus:

- Determine the object, the quality characteristic for evaluation, when there is more than one criterion of evaluation, decide how each criterion is to be weighted and combined for the overall evaluation.
- Determine the measurement methods
- Identify all influencing factors and determine the factor levels.
- Determine the noise factor and the condition of repetitions.

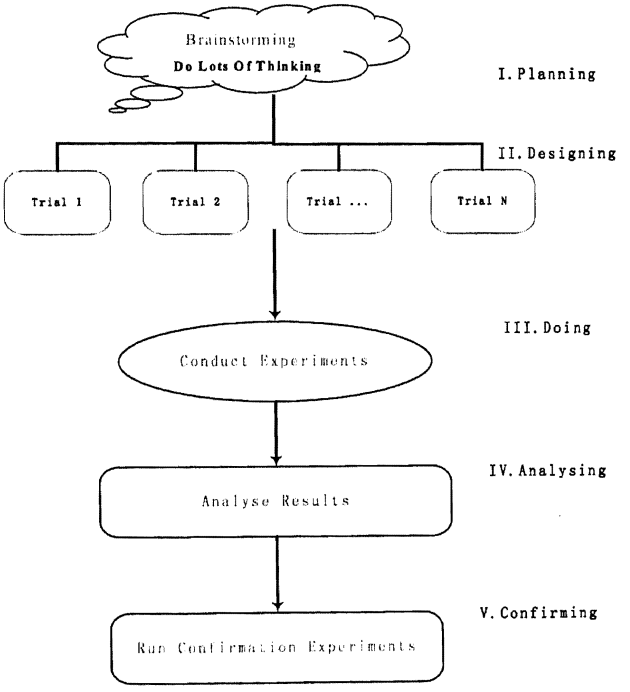


Figure 3 .2: Standard Taguchi procedure

II. Designing experiments. Design of Experiments (DOE) using Taguchi Approach is a standardised form of experimental design technique (referred as

classical DOE) introduced by R. A. Fisher in England in the early 1920's. In his early applications, Fisher wanted to find out how much rain, water, fertiliser, sunshine are needed to produce the best crop. As a researcher in Japanese Electronic Control Laboratory, in the late 1940's, Dr. Genichi Taguchi devoted much of his quality improvement effort on simplifying and standardising the application of the DOE technique.

DOE is an experimental strategy in which effects of multiple factors are studied simultaneously by running tests at various levels of the factors. What levels should we take, how to combine them and how many experiments should we run, are subjects of discussions. Factors are variables that have direct influence on the performance of the product or process under investigation. Levels are the values or descriptions that define the condition of the factor held while performing the experiments. Three factors (A, B and C) tested at 2-levels each requires 8 experiments - $A_1B_1C_1$, $A_1B_1C_2$, $A_1B_2C_1$, $A_1B_2C_2$, $A_2B_1C_1$, $A_2B_1C_2$, $A_2B_2C_1$, $A_2B_2C_2$. Since there was a danger of each experimenter designing different sets of fractional factorial experiments, Taguchi simplified and standardised the procedure by providing a framework for design, based on orthogonal arrays. In the case of fifteen two level factors only sixteen experiments would be necessary. Through statistical analysis techniques the optimum situation (any one of the 32,768 options) could be determined. Standard Notations for orthogonal arrays are as following:

Symbol $L_n (x^m)$

Where n = Number of experiments

x = Number of levels

m = Number of factors

$L_4(2^3)$ Orthogonal Array

Trial #	A	B	C
1	1	1	1
2	1	2	2
3	2	1	2
4	2	2	1

Taguchi has constructed a number of orthogonal arrays to accomplish the experiment design. Each array can be used to suit a number of experimental situations. The smallest among the orthogonal array is an L_4 constructed to accommodate three two level factors. The L_4 (2^3) array is used to design an experiment to study three 2-level factors. Some factors in the design may influence each other and may not be independent. Temperature and humidity, for example, interact in terms of human comfort level. The Taguchi method enables the study of both input factors, and the suspected interactions between them. However in the implementation of Taguchi methods within this theses no analysis of interactions is undertaken. The design of the experiments will be based on the following:

- Selecting the appropriate orthogonal array.
- Assigning factor and interaction to columns.
- Describing each trial condition.
- Deciding the order and repetitions of trial conditions.

III. Running experiments. The experiments are conducted following the exact design combination prescribed in the orthogonal array. Experiments are normally conducted to determine values of the quality characteristic associated with the factor levels determined from the orthogonal array.

IV. Analysing results.

After completing the tests and collating the data, ANOVA (analysis of variance) is then used to identify the optimum condition (in the case web site type) and the additional information about the relative influences of the factors and their significance. The main objective of ANOVA is to determine relative influence of the factors and interactions to the variation of the results. The variation of the results is determined by calculating the deviation of the results from the target. Taguchi followed basic statistical calculations such as average and analysis of

variance, but blends with it a new approach to the analysis results based on the deviation from the target instead of absolute values. The study of results based on the deviation from the target (or the average when a target is absent) allows selection of the design condition that is most consistent and yields reduced variation, which leads to improved quality. In summary, ANOVA (Analysis of Variance) is performed to determine the following:

- The optimum design
- Influence of individual factors.
- Performance at the optimum condition.
- Relative influence of individual factors. etc.

V. Confirming. Generally the best design condition predicted by the analysis is not one that currently exists or the one has been tested. Therefore, to verify if improvement is really achievable, or to determine how close the estimate matches actual performance, a number of samples made to the new design specifications are tested. Running the experiments at the optimum condition is the necessary final step.

In this project the analysis of data has been undertaken by Qualitek-4, a software package for the Taguchi Design of Experiments developed by Nutek, Inc. A demonstration version is available from www rkroy.com. The program selects the array and assigns the factors to the appropriate column. For more complex experiments, there is a manual design option. The program also performs the three basic steps in analysis: main effect, analysis-of-variance, and optimum studies. Analysis can be performed using standard or signal-to-noise ratios of results for smaller, bigger, nominal, or dynamic characteristics. Results can be displayed using pie charts, bar graphs, or trial-data-range graphs.

3.3.2 Taguchi and web site acceptability

Within this study of cross-cultural web usability / acceptability the full Taguchi method has not been adopted. Rather aspects of the approach have been

implemented in experimental design and results analysis. The main benefit has been that by testing a fraction of users and / or interfaces it has still been possible to obtain a significant amount of valuable information to determine values of the quality characteristic (in our case usability / acceptability) and the contribution of web site design characteristics. The approach will be made clear in future chapters.

Summary

This Chapter has

- Presented the research framework for the eCulture: UK and China project;
- Discussed overall research methodologies implemented in the top-down and bottom-up approaches and provided a very brief overview of each of the 7 main studies that constitute the whole project;
- Introduced Taguchi method and defined some key terms for describing the methods;
- Outlined the integrating of Taguchi methods in data experimental design and statistical analysis in research of cross-cultural web site acceptability.

Chapter 4

General cultural difference between British and Chinese users

Chapter objectives

This Chapter starts with a review of the typical language, communication and cultural differences between British and Chines users. It follows with an exploration of Geert Hofstede's work on cross-cultural dimensions and with their implications for usable web site development. The first practical study within the eCulture project is then discussed. This investigates the relationships between Hofstede's cultural dimensions and user perceptions aspects among different groups, using general statistical data analysis methods to derive conclusions.

4.1 Language and communication differences between British and Chinese citizens

In 5,000 years of history, Chinese is perhaps the most widely used language in the world. Its popularity and many specific features makes it a unique language. Chinese language differs from many Indo-European languages (like English) in important ways (Chang, 1992). For example, Chinese words generally do not have inflections to indicate grammatical attributes such as number, gender and case for nouns, or the tense and aspect for verbs. English, on the other hand, generally has inflectional markings. Moreover, Chinese words usually have no inherently marked lexical categories, while words in the English normally do. In addition, the Chinese adopted a writing system which is logographic in nature. Unlike the alphabetic principle, its script/speech relationship is highly opaque. The characters, as they are commonly called, represent lexical morphemes, whereas

alphabetic symbols, as in English, represent phonemes (Chao,1968).Undoubtedly, knowledge about how people process this specific language, Chinese, is indispensable to the general understanding of human language processing.

As a factor that national of each country uses their language and speech in a different way, it could lead to communication difference. Language is a tool of communication, delivering a message – but it is much more than that, it has strengths and weaknesses which project national character and even philosophy (Lewis, R. 2002). When someone attempt to surmount the linguistic hurdle by learning the language of the communication pattern of people from specific country, the former method is preferable as to get people more fully involved in the negotiation and able to express themselves better in terms of intent, mood and emotion.

There are difference in terms of communication pattern between Chinese and British (Lewis, 2002). As shown in Figure 4.1, British use their language to its best advantage, certainly, but they are not quick to attack with it. They will lean heavily on understatement and reservation; they will concede points to their opponent early on to take the steam out of the argument. But their tone implies that even so, right is on their side. They know how to be vague in order to maintain politeness or avoid confrontation, and they are adept at waffling when they wish to procrastinate or cloud an issue. During a meeting, British people will go steadily forward, but often introduce humour or understatement as negotiating tactics to soften their style.

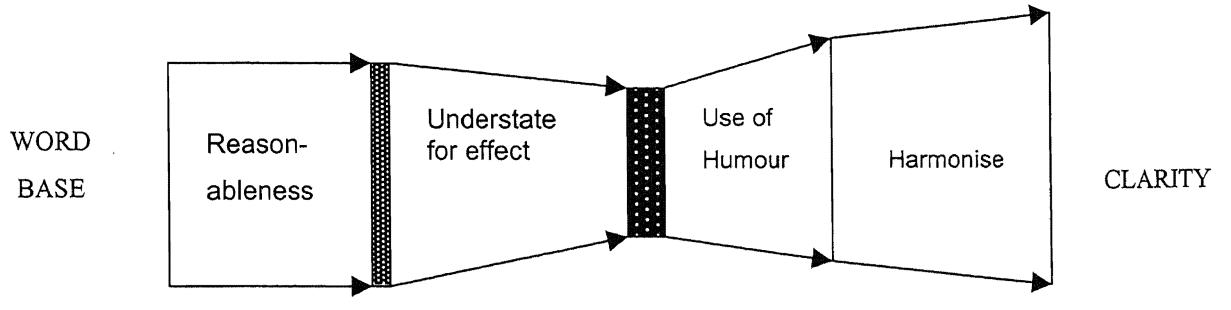


Figure 4.1: Communication pattern for British

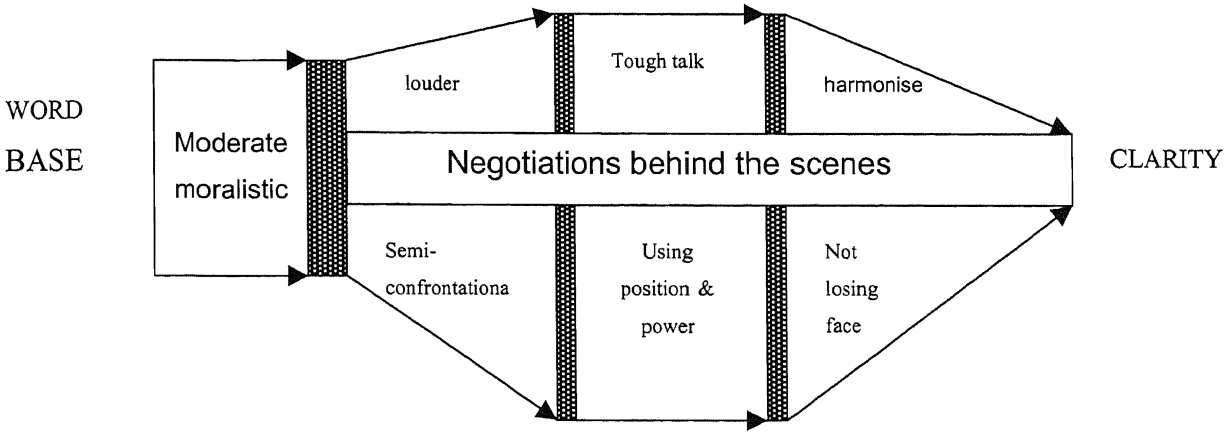


Figure 4.2: Communication pattern for Chinese

In the contrast, as shown in Figure 4.2, the Chinese communicating pattern is different from the British. Chinese people prefer meetings to be formal, and seating will be according to hierarchy. The real decisions will be made outside the meeting, which is principally for information gathering. The pace will be slow and repetitious, and the time frame is expected to be long. Politeness is observed at all time. Confrontation and lose of face (for both side) must be avoided. Once the Chinese have decided who, what when and how is best, they are very trustworthy.

4.2 Cultural differences between British and Chinese citizens

4.2.1 British citizens

It is very difficult to give a correct, complete and comprehensive picture of the British culture. However, Lewis (2002) and Harzing (2003) summarised some features of British culture which could be relevant in the field of cross-cultural usability.

- *Humour and understatement.* Humour is a saving factor in British life and many British people feel that as long as there is humour, there can never be utter despair. It is used in numerous ways: to establish a positive atmosphere, to create a sense of togetherness, to bridge differences, to introduce risky ideas, to criticise, to show appreciation or contempt of a person. British people joke about everything including the queen, politicians, religion and themselves. Humour is often combined with understatement. Depending on the tone "Not bad" can actually mean "very good" and "not bad at all" might be the highest praise you ever get from a British.

- *Indirect communication.* In contrast to Western Culture, for instance Americans, Germans and Dutch, British people have a quite indirect communication style. They will not usually "tell you just the way it is to get things in the open." It is necessary to read between the lines to understand what they really mean. Like the Japanese and the Chinese culture, British culture is a high context culture. Words are not enough, it is necessary to know the background and context to understand the message and interpret tone, expression and non-verbal behaviour.

- *Informality.* In spite of the fact that Britain is still well known for its class society, relationships in the workplace and in an educational setting are very informal. Most people call their boss and other colleagues by their first names and tutors usually expect students to address them by their first names as well. In general, tutors are very approachable and will often join you for a coffee in the break. Style of dress depends more on personal preference than on position or rank.

- *"No complaints" or patience.* British people are not very likely to complain. They will swallow bad service or bad food at a restaurant, because they do not want to make a scene. They might therefore become very nervous if you try to voice your dissatisfaction. Criticism should also preferably be voiced in

an indirect way. The British are usually very patient and will queue for everything. It is best to imitate this behaviour.

- *Friendliness*. Although the British are generally seen as being reserved in the North of England, people are usually quite friendly. They will appreciate it if you make a chat about the weather or take an interest in local affairs.

- *Polite & "quiet"*. British are very polite. British habits of politeness are on the whole very informal. All politeness is based on the elementary rule of showing consideration for others, and acknowledging the consideration they show. They are also very "quiet" and keep to themselves. Reserve, a show of modesty, and a sense of humour are part of British 's own nature.

Generic cultural variables as described in the anthropological literature are potentially useful in cross-cultural research. They make it possible for the researcher to derive requirements for different cultural groups, and develop materials and procedures in accordance with the participants' cultural backgrounds. According to an anthropological study conducted by Hampden-Turner and Trompenaars (1993), the British are mostly universalist, individualist, achievement oriented, moderately egalitarian and sequential. Hofstede's (1980) study reports that British showed low power distance and lower uncertainty avoidance, high individuality and reasonably high masculinity. Overall, an analysis of the anthropological literature (Trompenaars, 1993; Hofstede, 1991; Hoecklin, 1995) leads to a categorisation of British culture could be as follows:

- Low power distance (subordinates and superiors consider each other as equal),
- Low uncertainty avoidance (do not feel threatened by uncertainty),
- Individualistic (concern for the individual as opposed to concern for the collective),
- Quite masculine (roles may be more gender based and more focused on financial and professional goals than interpersonal relationships),
- Universalist (rule based rather than relationship based),
- Neutral (openly expressing emotion is not always appropriate),

- Very specific (business and private life do not overlap; extrovert),
- Achievement oriented (status is dependent on how well tasks are performed).

4.2.2 Chinese citizens

China, With a population over 1.2 billion, is a vast, complex country with great challenges and enormous opportunities that affect many dimensions of world economy, culture, and communication. The country consists of five regions that differ greatly by economic level, spoken language, and sub-culture. Anthropological literature (Hofstede, 1991; Hoecklin, 1995) and other researches (Stuck,2000;Gao and Ting-Toomey,1998), categorized Chinese culture as follows:

- *High power distance applied to hierarchical relationships in China.* A high power distance culture expects different managerial behavioral responses to be accorded to persons with different rank within the hierarchy. In the Chinese hierarchical system, each person is presumed to perform his or her action in accordance to specific role functions. On the basis of the Confucian paradigm, the most important relationship in Chinese culture involves the five cardinal relationships, which are ordered by the rule of hierarchy. These are those between ruler and subject, father and son, husband and wife, elder brother and younger brother, and between friends. The appropriate role subject, son and wife, are those of obedience, respect, and submission.

- *Role play relationships.* In Chinese culture, the position one occupies and the role one plays define not only how one should perceive oneself in relation to others but also how one should engage in communication with others. In essence, the notions of hierarchy and role relationships permeate every aspect of Chinese society. In Chinese culture, the position one occupies and the role one plays define not only how one should perceive oneself in relation to others but also how one should engage in communication with others. In essence, the notions of hierarchy and role relationships permeate every aspect of Chinese society. Chinese personal identities are connected closely with the social roles they play. The Chinese social code is of " acting a human being"

instead of " being" one. A recent study shows that Chinese report paying greater attention to social comparison information (e.g. 'my behaviour often depends on how I feel others wish me to behave') and others' status characteristics (e.g. 'I pay attention to my behaviour when I am with someone older than I am') than do the British . The English, in contrast, report greater ability to modify their self presentations, tendency to avoid public performances, sensitive to others' expressive behaviour, and self-monitoring that do Chinese. (Gudykunst, Gao and Franklyn-Stokes,1996).

- *Collectivistic Culture.* In China, people stress fitting in with, and belonging to the in-group, and they focus on a 'we' identity. Chinese culture is an example of collectivistic culture. In addition, unique characteristics of collectivistic cultures are advanced by Triandis (1998). He argues that the in-group (e.g. family and work unit) is very important in collectivistic cultures. In a collectivistic culture, the needs, goals, and beliefs of the in-group often take precedence over those of the individual. Consequently, people in an individualistic culture exist as independent entities, whereas those in a collectivistic culture are defined by their in-groups. While Western culture values individuality, Chinese culture values group mentality. Group mentality as contrasted to individuality is a major cultural value which is closely related to several other values including harmony over competition, restraint and submissive over-contention, and status over equality. (Xingwu, 1991). Chinese perceive family as the foundation of society. In Chinese culture, a close relational bond exists between the self and the family. For the Chinese, self, family serves as the primary and ongoing unit of socialisation. For Chinese, maintaining relationships is an integral part of communication because the Chinese self is defined by relations with others, and the self would be incomplete if it were separated from others. The self can attaint its completeness only through integration with others and its surroundings. Family is both a home and a community. In the family, one learns to communicate to others, to give or receive support and comfort, to express oneself, and to acquire a relational identity. A recent study in China has

shown that family members frequently interact with one another, and chit-chat is the second most popular family activity. Thus, verbal expressiveness is a common practice among family members. In addition, parents often are sought for advice when children encounter problems (Chu and Ju, 1993). Moreover, when friends become very close, Chinese consider them as members of the family. Consequently, kinship forms of address such as uncles, aunts, sisters and brothers are adopted in social relationships.

- *Guan Xi (connections and relationships) is important, focus on building long and trusting relationships.* Chinese communication is situated in relationships rather than in individual persons. To be modest is to treat oneself strictly and others leniently. Values are such as tolerance of others, harmony with others, and solidarity with others. Guan Xi is regarded as the most important interpersonal connection for Chinese. It refers to a relationship between object, forces, or persons. Guan Xi is also regarded as dyadic mutual interest and benefit. Once Guan Xi is established between two people, each can ask a favour of the other with the expectation that the debt incurred will be repaid sometime in the future.

- *High-context style of communication.* Hall (1976) argues that high-context communication involves in-directness, implicitness, and non-verbal expression. That is, "*most of the information is either in the physical context or internalised in the person, while very little is in the coded, explicit, transmitted part of the message*" (Hall, 1976). Hall's descriptions of both the low and high–context styles of communication provide a general characterization of U.S. and Chinese styles of communication, respectively.

- *Chinese people have long term orientation.* This can be explained through the roots in the basic teaching of Confucius. Bond (1986) and Hofstede (1991) summarised this dimension for Chinese as follow:

(a) Stability of society based on unequal relationships between people

(b) Family is prototype of all social organisations. Consequently, older people

(parents) have more authority than younger people (and men more than women)

(c) Virtuous behaviour toward others, Everybody's 'face' must be maintained

(d) Virtuous behaviour toward one's tasks in life, like education, hard work, and moderation in all things (the pragmatic side of Confucian dynamism cultural value).

4.3. Geert Hofstede's work on cross-cultural dimensions - implications in web development

In the 1980s the Dutch cultural anthropologist Geert Hofstede, formulate his theory that world cultures vary along fundamental dimensions. These reflect on people's patterns of thinking, feeling and acting. During 1978-1983, Hofstede interviewed over 100,000 IBM employees from 53 countries, looking for patterns of similarities and differences among his sample. Hofstede identified five dimensions and rated the 53 countries of his research in terms of each dimension with values. The five dimensions are:

- Power distance
- Collectivism versus individualism
- Femininity versus masculinity
- Uncertainty avoidance
- Long- versus short-term orientation

The detailed introduction of Hofstede's work (Hofstede, 1991) on cross-cultural dimensions and the implications in web development are as follows:

4.3.1. Power-distance (PD)

Power distance can be defined as the extent to which the less powerful members of institutions within a country expect and accept that power is distributed unequally. it refers to the extent to which less powerful members expect and accept unequal power distribution within a culture. According to Hofstede, high

PD countries tend to be politically centralised, with tall hierarchies in organisations and great differences in status and salaries. Besides, respect and obedience to experts and supervisors is expected and even desired. One the other hand, within low PD countries salaries and status vary less and hierarchies tend to be flatter, while equality is both expected and desired.

Differences in PD are apparent from two quite different scores for PD between China and the UK (60 and 35 respectively). Indeed, it is not a surprise that China is the top high power distance country in the world. China has over 4,000 years of political centralisation which tends to result in a tradition of obedience. The stability of society in China, according to Confucian views, is based on unequal relationship between people in a hierarchical social structure. In China, people accept differences in power more willingly (hierarchical tendencies) while in a low PD country (like GB and U.S.A), people do not accept differences in power willingly (egalitarian tendencies).

In terms of PD, Marcus and Gould (2000) suggest that web design be influenced for high and low PD countries respectively as follows:

- Highly structured access to information vs. lowly structured.
- Frequent and significant emphasis on social and moral order and their symbols vs. infrequent and minor.
- Strong focus on expertise, authority, certificates and formal and official symbols/logos vs. weak focus.
- Priority given on leaders and authorities vs. individuals.

4.3.2 Individualism vs. Collectivism (IC)

Individualism pertains to societies in which the ties between individuals are loose: everyone is expected to look after himself or herself and his or her immediate family. Collectivism as its opposite pertains to societies in which people from birth onwards are integrated into strong, cohesive in-groups, which throughout people's lifetime continue to protect them in exchange for unquestioning loyalty.

Chinese are very collectivist in nature, with an emphasis on the family relationships that will be necessary. In China, a child learns to respect the group to which he or she belongs, usually the family, and to differentiate between in-group members and out-group members (all other people), when these children grow up, they remain members of their in-group , and expect the in –group to protect them when they are in trouble. Collectivistic orientation is illustrated in the very structure of Chinese names, in which the family name comes first and the person's individual name always give last place and only used by close friends and family members.

Concerning individualism vs. collectivism in terms of web design, Marcus and Gould (2000) suggest that the two attributes will have the following impact on a web sites design respectively:

- Emphasis placed on the individual vs. emphasised collectivity.
- Motivation based on personal achievement and task completion rather than based on collective goals.
- Images of success represented by notions of materialism, consumerism and individual prosperity as opposed to notions of socio-political agendas achievement.
- Controversial and argumentative speech and tolerance to extreme opinions versus official slogans and hyperbole.
- Emphasis given on youth, change and novelty versus focus on experience, the aged, leaders and tradition.

4.3.3 Masculinity vs. Femininity (MAS)

Masculinity and femininity refer to gender roles. Traditionally, men are expected to be assertive, confident, tough and antagonistic, whereas women are expected to be oriented to home life and family, tender and caring, not competent, sensitive and understanding. The influence of MAS on web site design respectively is suggested to be as follows (Marcus and Gould 2000):

- Clear gender distinctions versus dim.
- Tasks designed to be completed individually and quickly in short period of time as opposed to action expected to be carried out cooperatively.
- Emphasis on competition versus cooperation.
- Graphics and sounds used practical purposes versus aesthetical pleasure.

4.3.4 Uncertainty avoidance (UA)

Uncertainty avoidance can be defined as the extent to which the members of a culture feel threatened by uncertain or unknown situations. This feeling is, among other things, expressed through nervous stress and in a need for predictability: a need for written and unwritten rules. Different cultures respond differently to the unknown and employ different behaviour towards ambiguity. According to Hofstede's analysis, high UA cultures tend to be formally structured with clear distinctions between social roles. Organisations, institutions and relationships are highly structured so as people can easily interpret situations and understand their role and what is expected from them. Also, high UA cultures encourage conformation and discourage "difference". By contrast, low UA cultures tend to allow more flexibility in social and personal relationships, encourage tolerance towards the "different" and show less fear towards ambiguous situations.

Marcus and Gould (2000) suggest that web sites designed within high UA cultures would have clear metaphors, limited choices, simple and predictable navigation and small amounts of information presented to the viewer. On the contrary, low UA web sites would employ highly complex navigation schemes, multiplicity of links and choices and richness of content.

4.3.5 Long- vs. short-term time orientation (LTO)

After a further study of the Asian culture, Hofstede added a fifth dimension in his theory, that of long and short-term time orientation (LTO). According to this dimension, culture can be divided in terms of behaviour towards problem solving:

High LTO cultures, also be called Confucian dynamism, tend to approach tasks strategically, aiming at skill acquisition and learning through experience. On the other hand, low LTO cultures tend to approach tasks more aggressively, aiming at immediate results and focusing at a short resolution.

In terms of web design, high LTO sites are expected to focus on learning, to be highly structured and encourage patience in achieving results, whilst low LTO web sites would emphasize on results and goal achievement (Marcus and Gould, 2000).

4.3.6 Hofstede scores and ranks

Hofstede identified five dimensions and rated the 53 countries of his research in terms of each dimension with values from 0 to 100. Table 3 lists Hofstede's ranks and scores for the related countries of the following practical study.

Table 4.1: Hofstede's dimensions of culture

	PD		IC		MF		UA		LTO	
Country	Rk.	Sc.	Rk.	Sc	Rk.	Sc	Rk.	Sc	Rk.	Sc.
GB	42	35	3	89	9	66	47	35	18	25
Greece	27/28	60	30	35	18	57	1	112		
U.S.A	38	40	1	91	15	62	43	46	17	29
China		80		15					1	118
Hong Kong	*15*	*68*	*37*	*25*	*18*	*57*	*49*	*29*	*2*	*96*
Taiwan	*29*	*58*	*44*	*17*	*32*	*45*	*26*	*69*	*3*	*87*
Singapore	*13*	*74*	*39*	*20*	*28*	*48*	*53*	*8*	*9*	*48*

Legend: PD: Power Distance Index; IC: Individualism index ; MF: Masculinity index; LTO: Long-term orientation index. Rk = rank Sc = score

It should be noted here, that scores related to some of the Hofstede's cultural dimensions, such as IDV, and UA, did not include China. However, Stuck (2000) gave 80 as China's Power distance score. And the results of IC, MF and UA for

China are a weighted average of Hofstede's scores for Hong Kong, Taiwan and Singapore (in those places people are regarded as same or similar culture as mainland China). Therefore, the evaluated Hofstede scores for China here are IC=15, UA=36, MF=50.

4.4. Study A: An online survey of generic culture variables

4.4.1 Aims of study A

Hofstede's theory originate from studies as far back as the 1970's. The first practical study within the eCulture: UK and China project set out to explore the extent to which such theories may still be relevant today. To begin to answer and verify this, a survey to investigate the relationships between cultural dimensions and user perceptions aspects among different groups was undertaken by adopting an on-line cultural factors survey.

4.4.2 Study A: methodology

The on-line cultural factor survey (as shown in Figure 4.3) consisted of Hofstede's 5-point answer scales questionnaire, which investigated IBM employees in 40 countries in 1970's. Subjects in this survey were asked to give scores from 15 job satisfaction questions relating to 3 of Hofstede's cultural dimensions (*power distance*, *individualism /collectivism* and *uncertainty avoidance*). Ninety- four Staff and students from University of Luton participated the survey and gave their reply (100% returned) for this study. The relationships between cultural dimensions and user perception aspects among different groups were explored by statistic analysis.

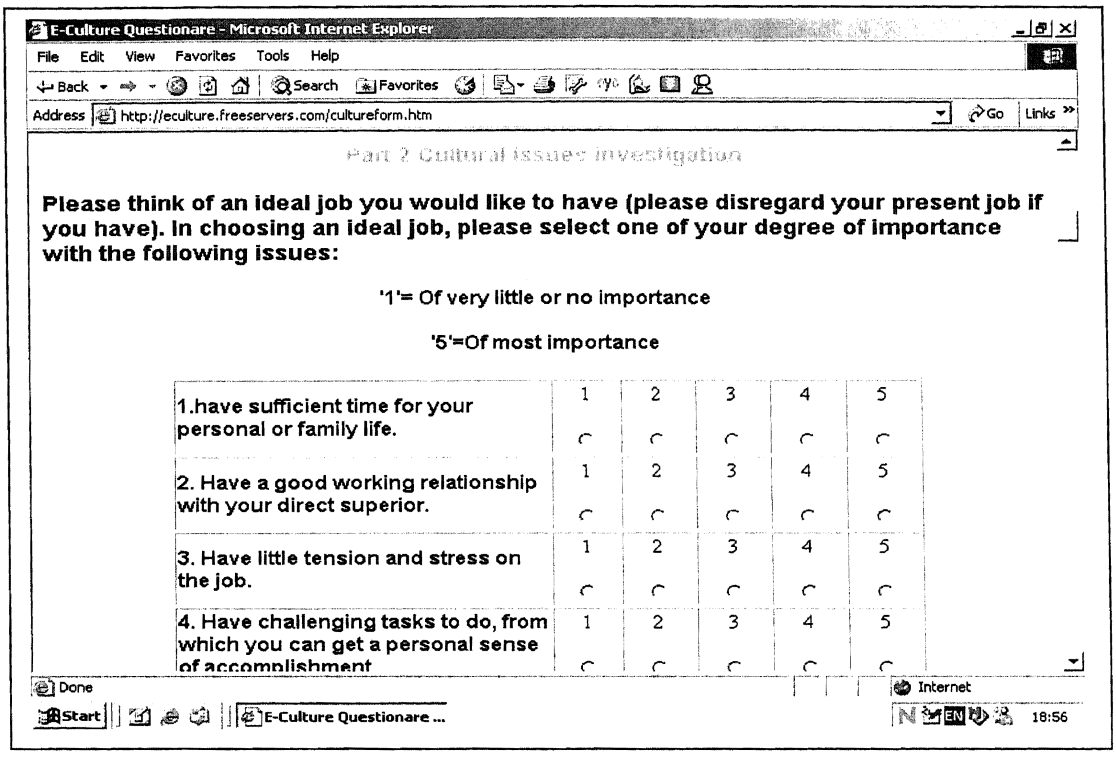


Figure 4.3: Online cultural factor survey
(http://eculture.freeservers.com/cultureform.htm)

4.4.3 Study A: data analysis and results

The subjects were divided into 3 groups (British, Greek and Chinese) according to their original culture. The Chinese and Greek groups consisted of students who came to the UK for their higher education. The limitation of this study is that comparing with 75 British users, Chinese and Greek groups are rather small. The mean scores of each group are presented in Table 4.2.

Table 4.2: Test groups and mean scores

GROUP	NUMBER OF SUBJECTS	MEAN SCORE OF POWER DISTANCE	MEAN SCORE OF INDIVIDUALISM / COLLECTIVISM	MEAN SCORE OF UNCERTAINTY AVOIDANCE
British	75	4.6711	5.4533	5.5644
Greek	7	4.8095	5.8571	5.7619
Chinese	12	4.8611	5.9722	6.3056
Total	94	----------	----------	-------

Figure 4.4 uses box plots to illustrate the score distributions related to specific cultural dimensions of each test group. Box plots are summary plots based on the median, quartiles, and extreme values. The box represents the interquartile range which contains the 50% of values. The whiskers are lines that extend from the box to the highest and lowest values, excluding outliers. A line across the box indicates the median.

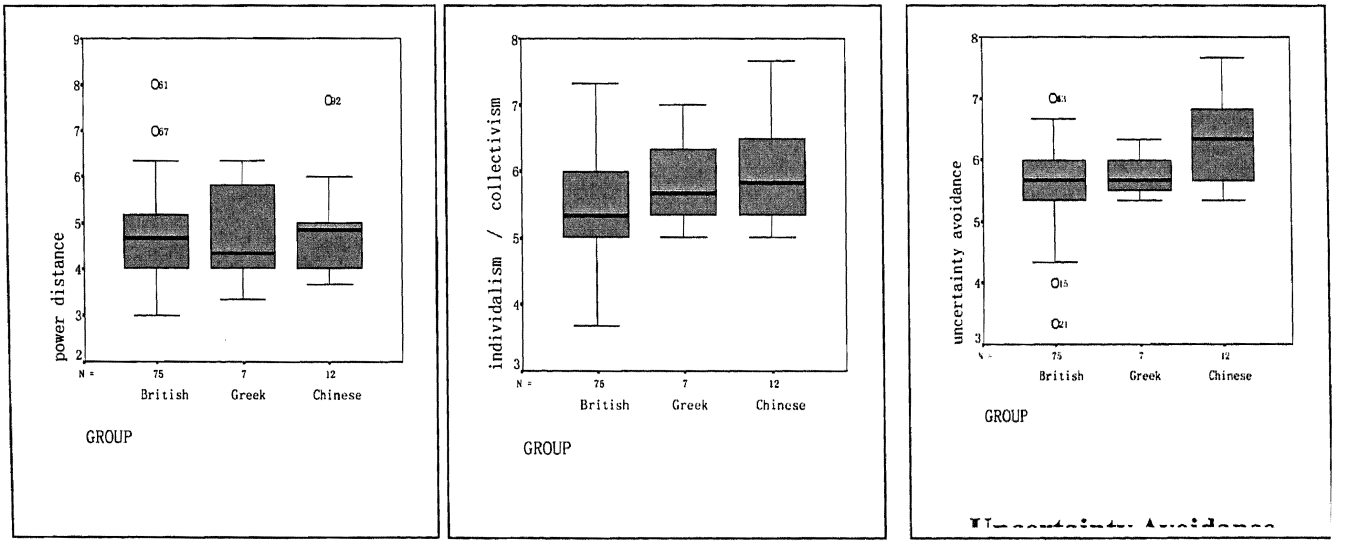


Figure 4.4: Scores distributions related to PD (left), IC (middle) and UA (right)

Figure 4.5 shows a comparison of mean score distribution of Power Distance derived from the user study compared with the theoretical values provided by Hofstede's cultural score value.

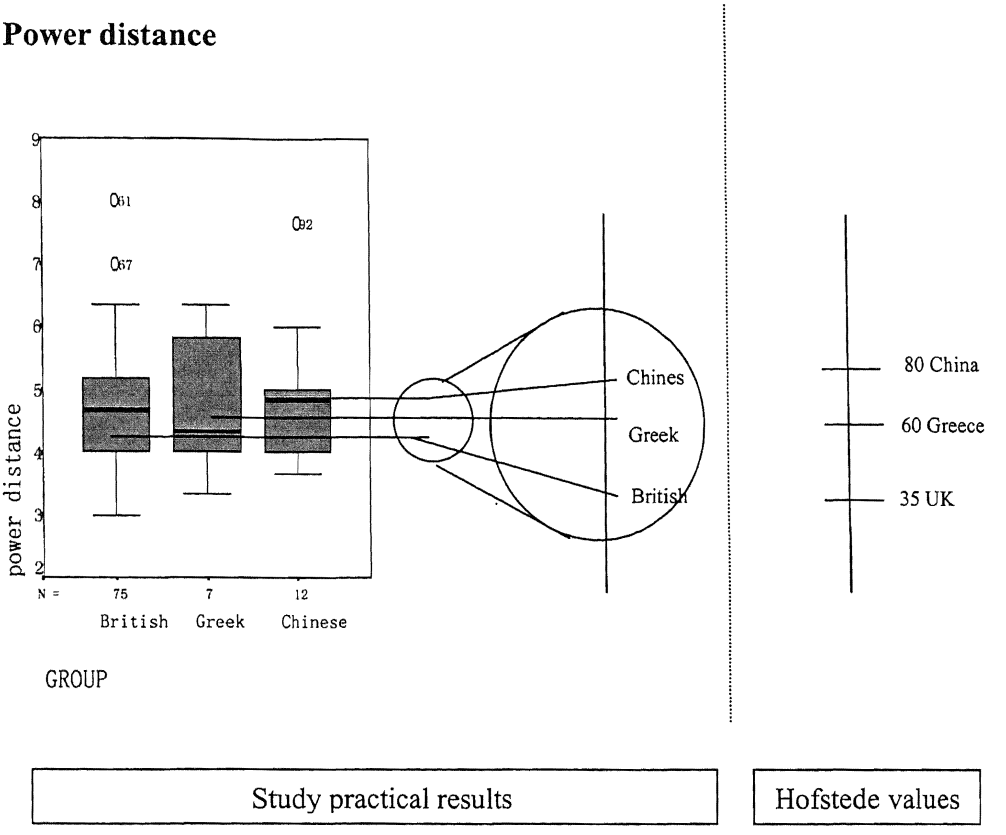


Figure 4.5: Power distance comparison

Mean score distribution from the test shows that British has the lowest PD mean score and Chinese has the highest PD, Greek 's PD mean score is in the middle. Hofstede's PD score distributed for these countries from lowest to highest are: UK, Greece and China. Therefore, mean score distribution from the test is similar to Hofstede's country score distribution.

Individualism / Collectivism

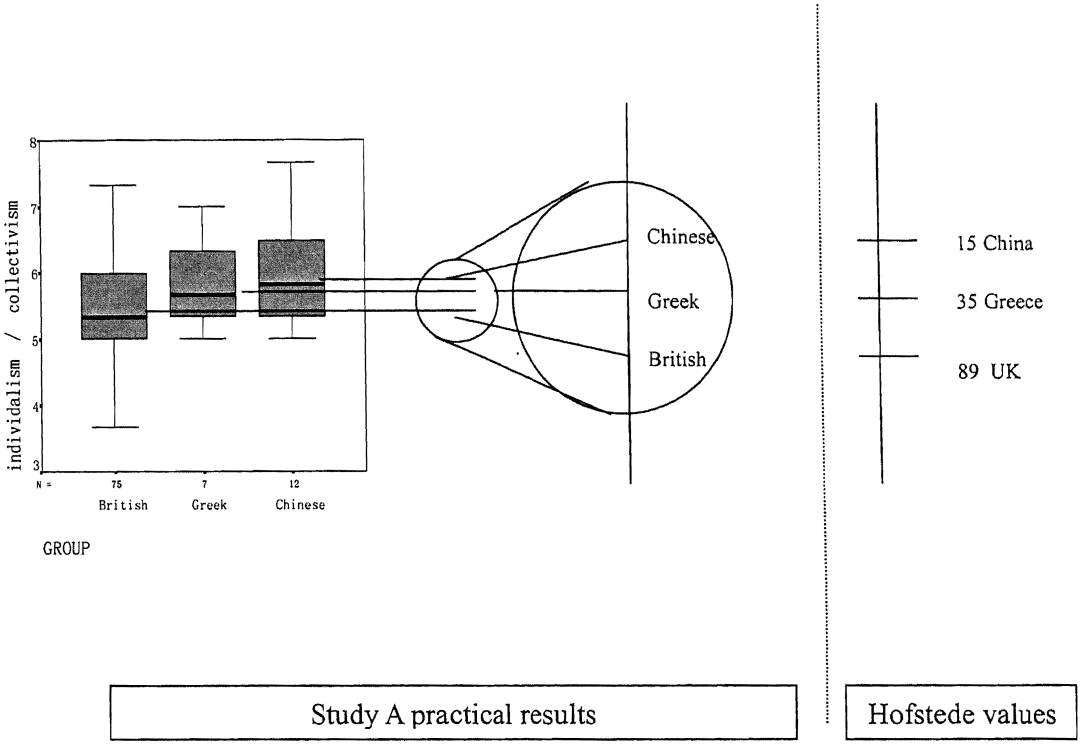


Figure 4.6: Individualism / Collectivism comparison

Mean score distribution from the test (refers to Figure 4.6) shows that British is highly individualistic, Chinese highly Collectivistic, IC mean score for Greek is in the middle. Hofstede's IC score distribution also indicated the same conclusion.

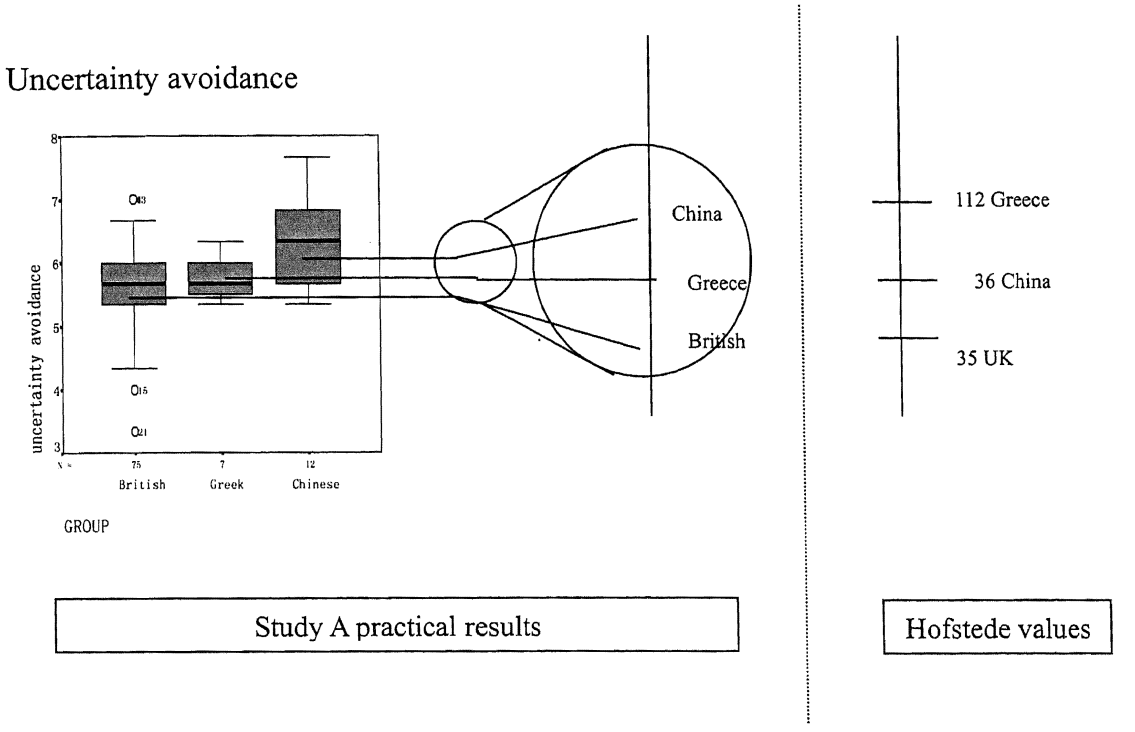


Figure 4.7: Uncertainty avoidance comparison

Mean score distribution from the test (refers to Figure 4.7) shows that uncertainty avoidance mean scores from highest to lowest are Chinese, Greek and British. In contrast, Hofstede's UA scores from highest to lowest are Greece, China and UK. Two possible reasons may lead to this. Firstly, uncertainty avoidance is mainly regarded as a western style of cultural dimensions. Therefore, Hofstede's questions relating to uncertainty avoidance may not suitable for Chinese. Results from test also shows Greek's mean score is higher than British 's mean score for uncertainty avoidance, which is similar to Hofstede's country score distribution for Greece and British. Secondly, numbers of Chinese and Greek subjects are rather smaller than number of British subjects, which may also lead to bias.

Most of the results are similar except the difference between Chinese and Greeks in *Uncertainty Avoidance* dimension. It is possible that the relatively small sample in the Greek group compared with other test groups may lead to the bias.

Having determined that differences seem to exist among the means, post-hoc range tests and pair-wise multiple comparisons were undertaken to determine the significance of the differences. As showing in Table 4.3 and Table 4.4, in the uncertainty avoidance dimension, the post-hoc test indicates that Chinese and British are significantly different (at .05 level), whereas there is no significant mean difference in both the other cultural dimensions (power distance and individualism / collectivism).

Table 4.3: Post Hoc test results (I)

ANOVA

		SUM OF SQUARES	DF	MEAN SQUARE	F	SIG.
power distance	Between Groups	.455	2	.228	.247	.781
	Within Groups	83.735	91	.920		
	Total	84.190	93			
individualism / collectivism	Between Groups	3.500	2	1.750	2.736	.070
	Within Groups	58.212	91	.640		
	Total	61.713	93			
uncertainty avoidance	Between Groups	5.741	2	2.870	6.117	.003*
	Within Groups	42.699	91	.469		
	Total	48.440	93			

Table 4.4: Post Hoc test results (II)

Multiple Comparisons

Tukey HSD

DEPENDENT VARIABLE	(I) GROUP	(J) GROUP	MEAN DIFFERENCE (I-J)	STD. ERROR	SIG.
power distance	British	Greek	-.1384	.37911	.929
		Chinese	-.1900	.29824	.800
	Greek	British	.1384	.37911	.929
		Chinese	-.0516	.45622	.993
	Chinese	British	.1900	.29824	.800
		Greek	.0516	.45622	.993
individualism / collectivism	British	Greek	-.4038	.31609	.411
		Chinese	-.5189	.24867	.098
	Greek	British	.4038	.31609	.411
		Chinese	-.1151	.38039	.951
	Chinese	British	.5189	.24867	.098
		Greek	.1151	.38039	.951
uncertainty avoidance	British	Greek	-.1975	.27072	.747
		Chinese	-.7411*	.21297	.002*
	Greek	British	.1975	.27072	.747
		Chinese	-.5437	.32578	.223
	Chinese	British	.7411*	.21297	.002*
		Greek	.5437	.32578	.223

* The mean difference is significant at the .05 level.

4.4.4 Study A: conclusions

Hofstede 's cultural dimensions have leaded to a key research pathway for this thesis for both top-down approaches and bottom-up approaches to analysis. Results from Study A – An online survey of generic cultural variables - shows that, although the theory came from 1970's, Hofstede 's definition of cultural dimensions and the approach he took for investigating difference group of people 's perception of culture would still seem to be feasible to today's research.

Study A also indicates that most of Hofstede's cultural dimensions' differences (such as power distance, individualism/collectivism, etc.) are still truly existing among different group of people nowadays. Uncertain avoidance may not be suitable for investigating eastern style culture such as Chinese. Indeed, Hofstede's data has stood the test of time, the longer his studies have been analysed and replicated by other researchers, the more his conclusions have been validated and affirmed.

Through the case study, Hofstede model is found to be applicable as a starting point for further investigation of culture and cultural variations, particularly for more qualitative research and analysis.

Summary

This Chapter has:

- Reviewed the typical language, communication and cultural differences between UK and Chines users;
- Explored Geert Hofstede's work on cross-cultural dimensions and with their implications for usable web site development;
- Deployed study A to investigate the relationships between Hofstede's cultural dimensions and user perceptions aspects among different groups, results by statistical data analysis shows that Hofstede's cultural dimensions' differences (such as power distance, individualism/collectivism, etc.) are still truly existing among different group of people nowadays.

However, it no yet to be established whether generic cultural differences such as Hofstede will impact on web usability. This will be the focus of the following studies.

Chapter 5
General web usability and Internet development investigation on Chinese and British web users

Chapter objectives

This Chapter investigates similarities and differences in web usability and Internet development between the two groups of users (Chinese and British) from first hand broad statistical information gathered in the UK and China.

5.1 Introduction

Differing cultural expectations of Internet content, are currently preventing global exploitation of markets in the Asia-Pacific region (Aoki, 2000). Thus, understanding web usability within specific cultural contexts and measuring web site usability is increasingly seen as being critical to web-designers and eCommerce enterprises as they increasingly seek to embrace globalisation and internationalisation (Lozier, 2000).

In spite of its potential importance as a trading partner, until recently there remained a surprising lack of comparative empirical studies about the comparison of web usability and Internet development between Chinese and British Internet users. So it would be valuable to carry out empirical research to specify the specific needs of users in China and UK, providing web site owners and developers with practical suggestion on how to build successful web sites for both Chinese and British users.

5.2 Study B: Comparative survey of usability and Internet development

5.2.1 Aims of study B

The main objectives of the study in this chapter are:

- To obtain first hand broad statistical information on importance of web usability for specify user group (Chinese and British) and explore whether or not web usability differences exist between the two groups of users;
- To investigating user attitude toward Internet development in the UK and China.

5.2.2 Study B: methodology

To achieve the objectives, a questionnaire was developed in English and translated to Chinese, and was initially administered as a pre-test to small group of participants. The UK version of the questionnaire was originally conducted in 2001 in the UK by optimum.web Limited, as part of a commercial project funded by Accenture Ltd. This aimed to investigate attitudes and behaviours for on-line Internet users. The Chinese version was conducted from December 2003 to February 2003 in China. It took a selection of questions from the original optimum.web questionnaire.

Table 5.1: Users information

Group		Sex		Total
	Location	male	female	
Chinese users	Beijing	67	28	95
	Dalian	46	19	65
	Kunming	27	3	30
	total	140	50	190
British users	UK	108	38	146

The actual Chinese study population consisted of a total of 190 Chinese University under-graduate and post-graduate students residing and studying in different regions in China (as showing in Table 5.1). The respondents were

located in Beijing (Capital City of China), Dalian (a northeastern city) and Kunming (a southwestern city). Ages varied were from 20 to 35 during the time of the study. For the UK study, 146 British users were selected across UK, age from 20 to 35, with similar educational levels, professions, and gender.

The questionnaire contained questions designed to collect information on demographics, attitudes towards the importance of usability web usability issues attitude toward Internet development In related to two scenarios. After data from the two version of questionnaire (in two scenarios) were gathered, statistical analyses was implemented to investigate differences between the two user groups.

5.3 Scenario 1 (Booking holiday on line) – web usability investigation

5.3.1 Introduction of the questions

In the first scenario investigations were carried out by asking users to consider the problem of finding out about and booking a holiday. Respondents were asked to give responses to various questions, on a scale of one to ten, where ten is essential, and one is not at all important. They were asked "how important is it to you personally that the web site is the according to the following questions:

- Faster download time
- Easy to use
- Users have the ability to customise web content
- Complex functionality
- Web site is for a well established company
- High levels of movement and animation
- Tailored content that is specific to users' needs

5.3.2 Data analysis and results

Descriptive Statistics analysis and Mann-Whitney statistical analysis of the significant difference comparison are shown in Table 5.2.

A number of similarities between the groups are evident:

- Both Chinese and British users prefer *faster down load time*. Their mean score

to this issue are both high (Chinese=7.39; British =7.9);

- *Complex functionality is* not an important issue for both British and Chinese user.
- Both Chinese and British users regard *content that is specific to users' needs* as important issues

Table 5.2: Statistical analysis for the case study

	CHINESE (N=190)		BRITISH (N=146)		SIG.	
	Mean	Std	Mean	Std		
Faster download time	7.39	2.627	7.90	2.064	0.267	
Easy to use	7.78	2.101	8.31	1.787	**0.031**	*
Users can customise web content	8.02	2.502	4.80	2.485	**0.000**	**
Complex functionality	4.68	2.481	4.84	2.413	0.709	
Web site is for a well established company	5.58	2.588	6.64	2.636	**0.000**	**
High levels of movement and animation	5.30	2.670	3.69	2.167	**0.000**	**
Content that is specific to users' needs	6.72	2.646	7.25	1.932	0.167	

Notes: ** indicates that the significant difference (sig.<0.01) is at 99% significant level;

* Indicates that significant difference (sig.<0.05) is at 95% significant level.

However some interesting statistically significant differences emerged from the analysis. Unsurprisingly, both Chinese and British users prefer *Easy to use* web sites. But there is a significant difference (p<0.05) in its relative importance.

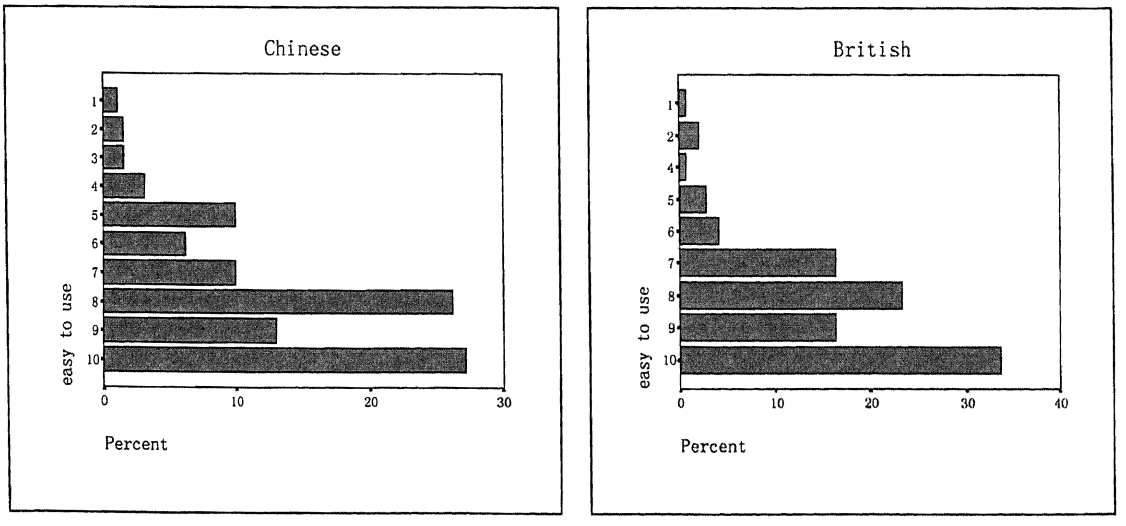


Figure 5.1: Frequency distribution (Easy of us)

To explore the difference further a frequency distribution (Figure 5.1) of the two groups of users was plotted.

Results show that 89.7% of British users give high score (>6) to the importance level of ease of user, whereas only 76.4% of Chinese users give high score (>6) to this issue. Comparing with 17.3% of Chinese users give score 5 to this issue, only 6.2% of British user give score 5 to this issue. The results implicate that usability (ease of use) would not appear to be such an important concern for Chinese web users.

Chinese users preferred web sites where *Users can customise web content* with a fairly high mean score (8.02). In contrast, British users gave a low mean score (4.8) to this issue. As a result, there is significant difference ($p<0.05$) between Chinese and British according to this issue. This issue indicates when designing web site for Chinese users, the web developer should take more attention to web content so as to satisfy the variety of taste for Chinese users.

The same situation occurs in consideration of the issue *'high levels of movement and animation'*. Chinese users prefer web sites to be more animated (mean score=5.30), compared to British users (mean score=3.69). There is significant different ($p<0.01$) between Chinese and British according to this issue. This indicates that web sites with high levels of movement and animation may attract to Chinese users but annoy British users. Therefore, two version of sites according to different groups of users may need to be considered by the web developers.

The issue of company 's reputation *('Web site is for a well established company')* also shows some statistical differences between British users (mean score=6.64) and Chinese users (mean score=5.58). There is significant difference ($p<0.01$) between the two groups of users. In the e-commerce context, the consumer is not able to verify some issues, such as a payment transaction, quality of the products as reliably as they would in real time. So company has higher reputation, will gain more trust by the web users. Therefore, both British and Chinese users regard company's reputation as an important issue and they gave high score (>5)

here. But the mean score given by British users is higher than mean score given by Chinese users, and there is a significant ($p<0.01$) difference between the two groups of users. Results form frequency distribution (Figure 5.2) indicates that 60.3% of British user prefer "*web site is for a well established company*" (score > 6) , whereas only 37.2% of Chinese users think so. This indicates that reputation is highly emphasised by British web users rather than Chinese web users. It may be speculated that Chinese users may consider other issues, such as price, method of payment will also take effect for their on line purchase rather than merely considering the reputation of the company.

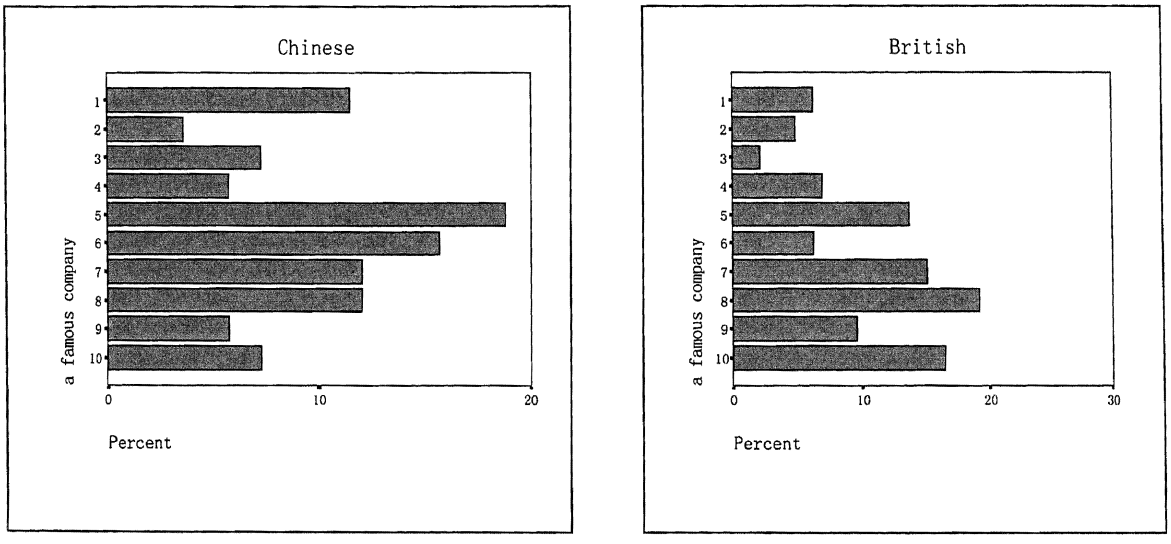


Figure 5.2: Frequency distribution (Web site is for a well-established company)

5.4 Scenario 2: (Questionnaire)- Internet development investigation

5.4.1 Introduction of the questions

During the first part of the study, users were asked to indicate the importance they place on a number of issues according to the following questions (Table 5.3):

Generally, since you first started using the Internet, do you think it has become better, worse or is it about the same for the following aspects?

Table 5.3: Web usability questions

	BETTER 5	SAME 3	WORSE 1	DON'T KNOW 0
1). The general speed of accessing web sites				
2). Value for money of subscribing to the internet				
3). Ease of searching for things				
4). The general quality of web sites				

5.4.2 Data analysis and results

1) The general *speed* of accessing web sites

Table 5.4: Descriptive statistics (Speed)

Group	N	Mean	Std. Deviation
Chinese	191	2.24	1.430
British	146	3.34	1.642

As shown in Table 5.4, in average, Chinese users are less satisfied with the speed of accessing web sites, their mean score is fairly low (mean=2.24). In contrast, the mean score for British users is higher (mean 3.34), which means British users are slightly more tolerant with the current speed of accessing the net.

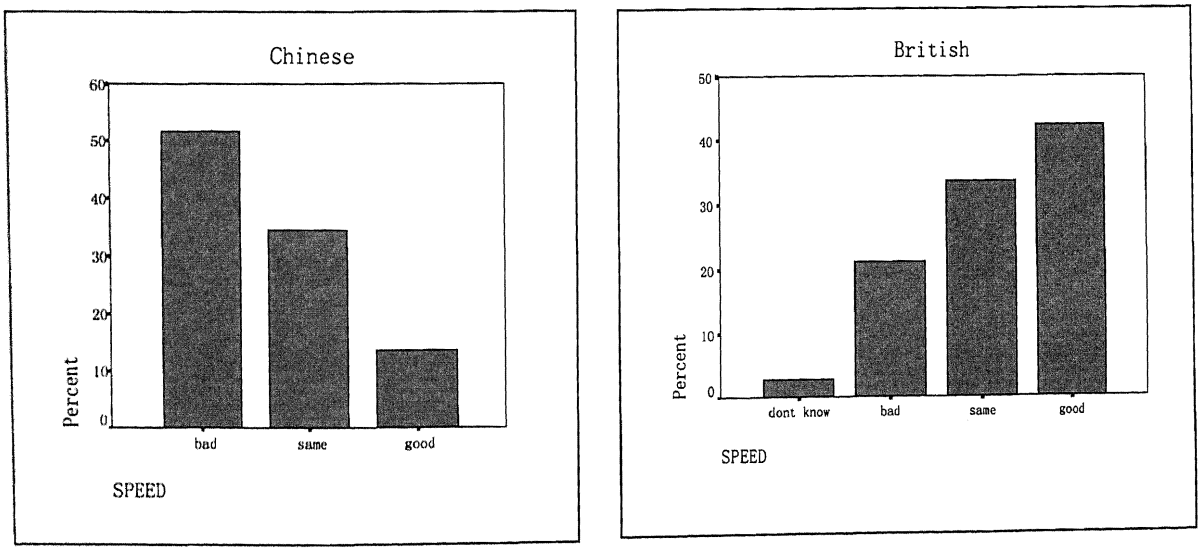


Figure 5.3: Frequency distribution (speed)

Mann-Whitney statistical analysis (Table 5.5) indicates that attitudes to speed are significant different ($p<0.01$) between Chinese and British users. The frequency distribution (Figure 5.3) shows that 51.8% of Chinese users think the speed is still not faster than before, whereas only 21.2% of British users think the speed is still not good. 42.5% of British users satisfy with the speed, but for Chinese users, only 13.6% of the whole think the speed is good by now.

Table 5.5: Mann-Whitney analysis the significant difference level between Chinese and British

	CHINESE (N=190)		BRITISH (N=146)		SIG. (2-TAILED)	
	Mean Rank	Sum of Rank	Mean Rank	Sum of Rank		
Speed	142.32	27183.50	203.90	29769.50	**.000**	**
Fee	127.22	24299.00	223.66	32654.00	**.000**	**
Search	160.22	30602.00	180.49	26351.00	**.038**	*
Quality	120.58	23031.00	232.34	33922.00	**.000**	**

(Notes:

** indicates that the significant difference (sig.<0.01) is at 99% significant level;

* indicates that significant difference (sig.<0.05) is at 95% significant level.)

Nowadays, Internet infrastructure (such as broad band) has been improved rapidly, for both web users in UK and China. But the investigation here indicates that there is still so much more work needing to be done to increase Internet speed so as to satisfy the requirement for Chinese web users.

2) Value for money of subscribing to the Internet

Table 5.6: Descriptive statistics (Cost)

Group	N	Mean	Std. Deviation
Chinese	191	2.40	1.451
British	146	4.13	1.425

As shown in Table 5.6, Chinese users are still not satisfied with the cost of subscribing to Internet, therefore, their mean score are lower than 3. On the other hand, the mean score of British users (mean=4.13) are higher than 4, it indicating that British users accept the cost of subscribing to the Internet more readily.

Statistical analysis (Table 5.5) also indicates that attitudes to "***Value for money of subscribing to the Internet***" are significant different ($p<0.05$) between Chinese and British users. However, frequency distribution (Figure 5.4) shows 45.5% of Chinese users not satisfied with the cost for subscribing Internet, whereas only 1.4 % of British users think so. 67.1% of British users satisfy with the cost, but for Chinese users, only 15.7% of the whole think the cost by now are reasonable.

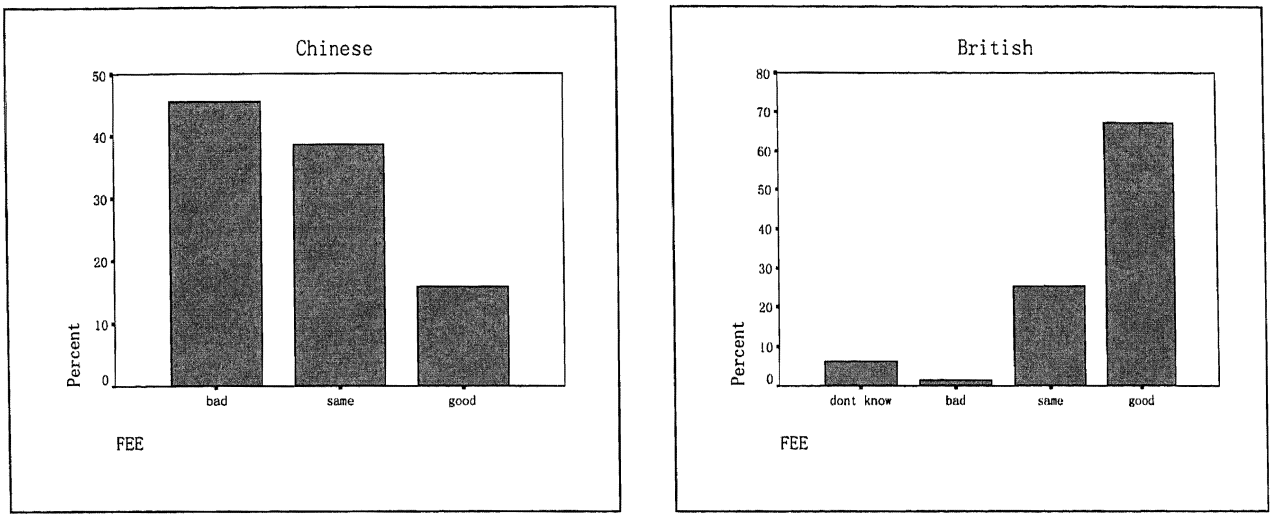


Figure 5.4: Frequency distribution (Cost)

Results here indicate that most of Chinese users regard the total cost for internet application to be higher than their expectation, Government and ISPs need to consider this issue and to do something so as to reduce the cost for Chinese web users.

3) Ease of searching

Table 5.7: Descriptive statistics (Search)

GROUP	N	MEAN	STD. DEVIATION
Chinese	191	3.55	1.439
British	146	3.86	1.403

As shown in Table 5.7 the mean score of Chinese user (mean=3.55) is similar to the mean score of British user (mean=3.86). Overall, the mean score of ease of searching for web users in both UK and China are above 3, that means ease of

searching has been improved than before.

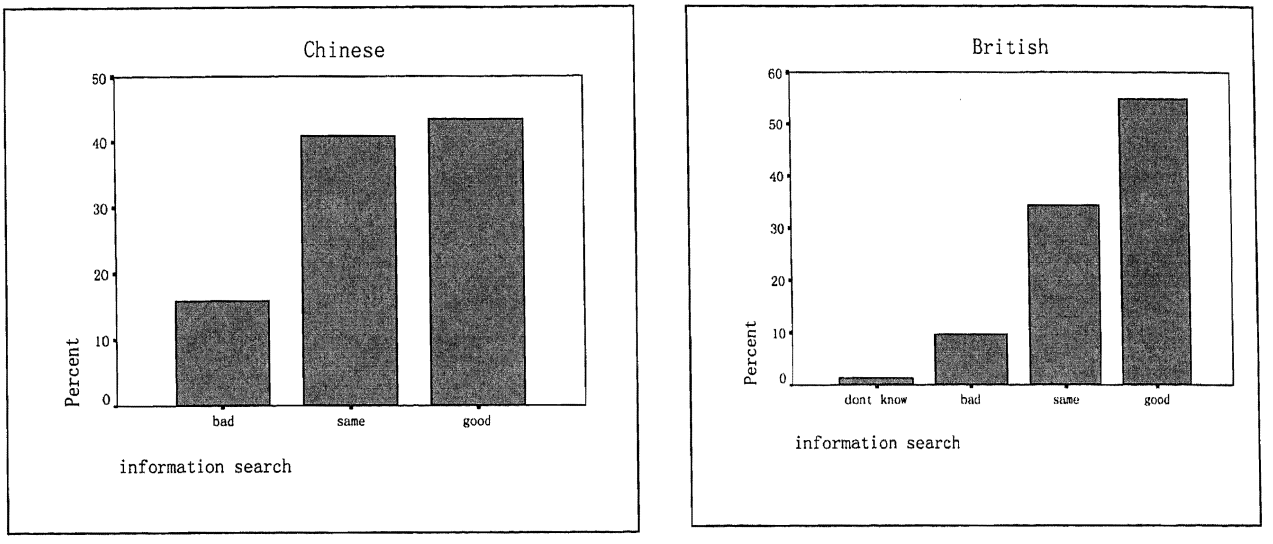


Figure 5.5: Frequency distribution (Ease of searching)

Statistical analysis (Table 5.5) indicates that attitudes to "*Ease of searching for things* " are significant different ($p<0.05$) between Chinese and British users. As frequency distribution in Figure 5 shows, comparing with 40.8% of Chinese users, 34.8% of British users think ease of search information still same since they first use internet; 54.8% of British think there is more easy for search on the internet, whereas 43.5% of Chinese users think so.

The reasons may due to: firstly, British users have long history of Internet usage so they have gained more experience in searching than Chinese users; Secondly, most of the Internet resources nowadays use English as the main language, therefore, there are not so many Chinese search engines for Chinese users. As a result, Chinese users need more training to gain their experience for searching. But it also could represent a great chance or challenge for search engine companies to developing Chinese version search engineers to make profit in Chinese market.

4) The general quality of the web site

Table 5.8: Descriptive statistics (Quality)

GROUP	N	Mean	Std. Deviation
Chinese	191	2.61	1.230
British	146	4.36	1.069

As shown in Table 5.8 the attitudes to '*general quality of the web site*' are significantly different between the two group of users. Chinese users are still not satisfied with the general quality of web site, therefore, their mean score (mean=2.24) is fairly low. In contrast, the mean score for British users is higher.

Statistical analysis (Table 5.5) also indicates that attitudes to general quality of the web site is significantly different ($p<0.01$) between Chinese and British users. Figure 5.6 shows, British users have higher positive attitude (71.2% of whole think quality is good) toward the quality of the site than Chinese users (only 11% think quality is good), as a result, Chinese users have a higher negative attitude (30.4%) toward quality of the site than British users (only 2.1%).

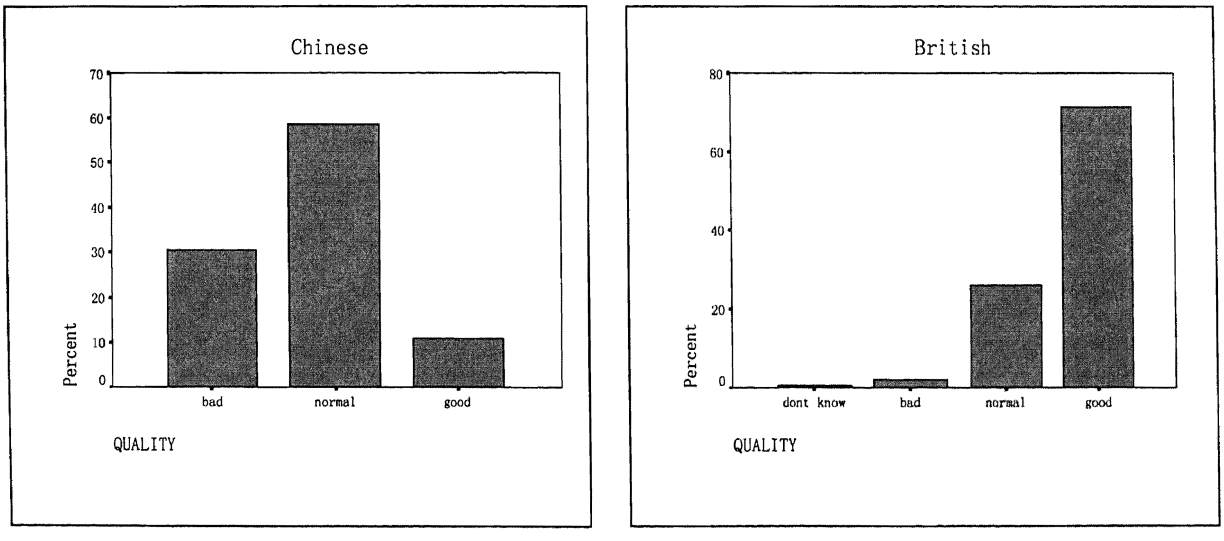


Figure 5.6: Frequency distribution (Quality)

Results here indicate that the improvement of general quality of web site seems to be very important in China.

Finally, in order to explore the relationships between each of the factors for British and Chinese users respectively, a correlation analysis has been performed, using SPSS to conduct the results. Refer to Table 5.9 and Table 5.10.

Table 5.9: Correlation results for Chinese users

Correlations [a]

		SPEED	QUALITY	FEE	information search
SPEED	Pearson Correlation	1	.322**	.276**	.136
	Sig. (2-tailed)	.	.000	.000	.061
	N	191	191	191	191
QUALITY	Pearson Correlation	.322**	1	.259**	.086
	Sig. (2-tailed)	.000	.	.000	.234
	N	191	191	191	191
FEE	Pearson Correlation	.276**	.259**	1	.099
	Sig. (2-tailed)	.000	.000	.	.173
	N	191	191	191	191
information search	Pearson Correlation	.136	.086	.099	1
	Sig. (2-tailed)	.061	.234	.173	.
	N	191	191	191	191

**. Correlation is significant at the 0.01 level (2-tailed).

a. GROUP = Chinese

For Chinese users, there are significant correlations between (speed-quality) and (speed-cost). The other significant correlated factor pairs are (quality-cost). Altogether, there are 3 pairs of significant correlated factors for Chinese users.

Table 5.10: Correlation results for British users

Correlations [a]

		SPEED	QUALITY	FEE	information search
SPEED	Pearson Correlation	1	.781**	.782**	.847**
	Sig. (2-tailed)	.	.000	.000	.000
	N	146	146	146	146
QUALITY	Pearson Correlation	.781**	1	.851**	.788**
	Sig. (2-tailed)	.000	.	.000	.000
	N	146	146	146	146
FEE	Pearson Correlation	.782**	.851**	1	.778**
	Sig. (2-tailed)	.000	.000	.	.000
	N	146	146	146	146
information search	Pearson Correlation	.847**	.788**	.778**	1
	Sig. (2-tailed)	.000	.000	.000	.
	N	146	146	146	146

**. Correlation is significant at the 0.01 level (2-tailed).

a. GROUP = British

For British user, there are significant correlations between (speed-quality), (speed-cost), and (speed-search). The other significant correlated factors are (quality-cost), (cost-search), and (quality-search). Altogether, there are 6 pairs of significant correlation factors for British users, whereas there are only 3 pairs of significant correlation factors for Chinese users. It could be speculated that British users have more experienced of Internet than Chinese users and take more issues into account during their assessment.

5.5 Study B: conclusions

From the studies, the following important issues have emerged:

1) The scenario, in relation to the Internet development investigation, British users gave very positive attitudes for the Internet development in the UK. Whereas, Chinese users gave negative attitudes. Therefore, much work need to be done in China, especially to improve *web site quality*, reduce *cost*, and improve *speed.*

2) In relation to the web usability investigation, seminaries and differences exist between users in UK and China. Firstly, both Chinese and British users regard *faster download speed*, *easy to use*, and *content that is specific to users' needs* as effective way to improve web usability. Secondly, both of the two groups of users think *web site has complex functions* is not an important issue relating to web usability. Thirdly, differences also exit between the two groups of users. *Users can customise web content* and *high levels of movement and animation* are appealing for most of Chinese users but not for British users. On the other hand, *web site is for a well established company* will be more attractive to British users than Chinese users.

Results so far shows that, in general, people from different group / culture may have different attitudes toward web usability. That means there are no general web usability rules, which could apply for users everywhere. Therefore, web

usability must need to be encapsulated with specific cultural considerate so as to be applied to target culture.

Although the small element is just a starting point for the eCulutre research, the investigation indicates usability is not yet well known in China. It therefore consolidated the belief on the promising prospect of promoting usability and acceptability for web site development in China. At the same time it provides a basis to figure out a feasible way to achieve the goal. However, further study still need to be done to have a complete understanding of the circumstances for both of the two groups of users.

Summary

In this Chapter:

- The empirical study to investigate similarities and differences in web site usability and Internet development between users from Mainland China and the United Kingdom has been reported;
- Results indicated that differences truly exist between Chinese and British users toward web usability /acceptability.

Chapter 6

Differences in perception and preference for British and Chinese web site users

Chapter objectives

This Chapter begins to explore differences between British and Chinese web site users in their perceptions and preferences in actual interaction scenarios. It presents a pilot study comparing British and Chinese user responses to some eFinance web sites.

6.1. Introduction

In the previous two Chapters (Studies A and B) general issues relating to culture and to web usability have been investigated and through statistical analysis, several conclusions for similarity / difference between British and Chinese users have been established. In this Chapter, the first user based study is presented. This is, in effect, a pilot study, which attempted to explore the differences in perceptions and preferences for specific web sites between British and Chinese users. Previous empirical studies have indicated that cultural preferences for web site content do in fact exist. (Fink and Laupase, 1999).

As with Study B (Comparative survey of usability responses) the methodology replicated a study undertaken by commercial organisations (optimum.web / Accenture). A partial factorial experimental design method is implemented to determine the importance of different web site design features for the two user groups. As with Study A (Online survey of generic cultural variables), the fieldwork was undertaken in the UK (the main reason why it is referred to as a pilot study) and the limitations of this are acknowledged. However much more

extensive user testing in Mainland China is presented in future studies.

6.2 Study C: Comparative study of usability in action – pilot study in eFinance – background and aims

As described in Chapter 5 in reference to Study B (Comparative survey of usability responses) during December 2000 / January 2001, optimum.web limited (OWL) worked with Accenture in a project aimed at finding out more about user requirements for and responses to web sites. One aspect of this study involved establishing the importance of key design issues, which influence user satisfaction and acceptance.

The OWL/Accenture study investigated the importance of the following design issues within the eFinance environment:

- *Information intensity.* A web site with detailed information will present the user with a complex information space and invite the user to explore it within a relatively complex environment. A web site with minimal information will overtly attempt to present summary information only, in a relatively simple environment.

- *Focus.* A product focussed web site essentially presents a brochure to the user and invites him / her to explore it whereas a user focused web site tries to support the user in finding information or products that they require

- *Style.* This relates to the degree of textual vs. visual and includes aspects of the use of graphics and / or animation.

It established that these three issues were indeed significant in influencing user responses to eFinance web sites for a range of user characteristics (such as age,

gender and expertise). It also established the relative importance of each factor within user satisfaction / acceptance.

It was decided to replicate the OWL/Accenture study for a specified user group. One part of the OWL/Accenture study investigated responses from 'young male experts' – UK male citizens between 18 and 24 with over two years Internet expertise. The study reported in this Chapter, replicated the work with Chinese 'young male experts' based in the UK. By minimising user variability (using the same user group) it should be possible to measure any differences in responses as a result of differences in culture between the UK and Chinese sample

.

6.3 Study C: Methodology

The methodology implemented utilises aspects of the Taguchi method discussed in Chapter 3. The same four eFinance web sites used within the OWL/Accenture study (Figure 6.1) were used as a basis for the user tests. The sites were chosen to fit the L_4 orthogonal array (refer to chapter 3) as show in Table 6.1.

In this study the orthogonal array was used to specify different types of web site design factor. Three web site factors were chosen, each existing at two levels in the orthogonal array - *information* (either detailed or minimal), *focus* (either user or product focussed) and *style* (either mainly textual presentation or a mixture of text with significant graphics and / or animation).

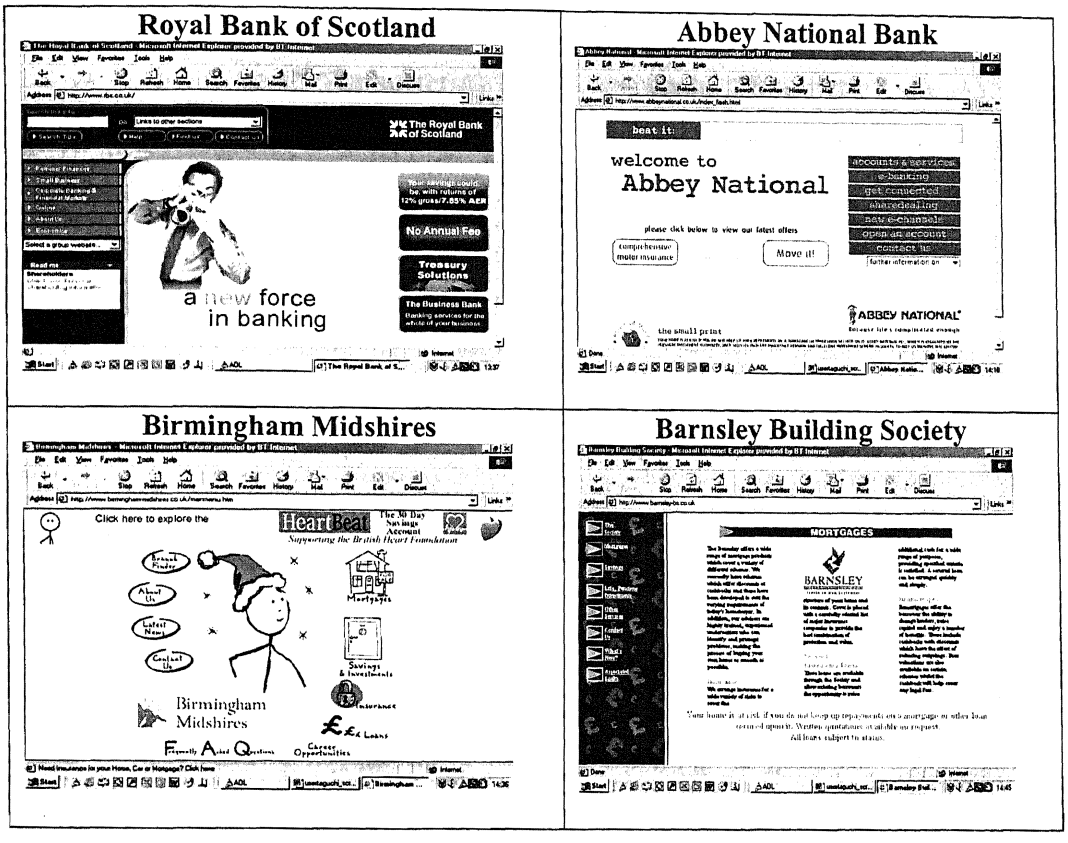


Figure 6.1: eFinance testing sites

Table 6.1: Orthogonal array: factors levels and web sites selected

INFORMATION	FOCUS	STYLE				SITE
1	1	1	Detail	User	Text	RBS
1	2	2	Detail	Products	Graphic	AN
2	1	2	Minimal	User	Graphic	BM
2	2	1	Minimal	Products	Text	B

Legend:
RBS = Royal Bank of Scotland (http://www.royalbankscot.co.uk/)
AN = Abbey NationalBank (http://www.abbeynational.co.uk)
BM = Birmingham Midshires Building Society (http://www.askbm.co.uk)
B = Barnsley Building Society (http://www.barnsley-bs.co.uk)

It is important to note that all sites were English languages ones and the studies were conducted in the UK. As a result, there may be potential differences in behaviour between Chinese users with Chinese sites in China. As stated above, it

was decided to minimise user variability between the two user groups (British and Chinese) so that the effects of the web sites would be most prominent. Both user groups were therefore similar in terms of age, gender and Internet expertise all being described as 'young male experts'. The Chinese users were mainly post-graduate students at the University of Luton who had been previously educated in China. They had a suitable level of English language proficiency to be able to interact realistically with the web sites.

The users explored the four eFinance web sites with the aim of locating specified mortgage information. Each test subject then completed a usability satisfaction questionnaire (in English) consisting of 20 questions, which related to the following usability evaluating issues:

(a) Easy to find information and get help
(b) Easy of task accomplishing
(c) Colour and aesthetic design
(d) Quick speed and efficiency of navigation
(e) Attractiveness of the page and positive impression
(f) Propensity to recommend to others

6.4 Study C: Data analysis and results

After completing the tests and collecting the data, analysis of variance is then used to identify the optimum condition (in the case web site type) and the strength of each of the factors. The results from the usability satisfaction questionnaires formed the basis for the quality characteristics used in the Taguchi (ANOVA) analysis and results for British and Chinese uses are shown in Table 6.2 and Table 6.3 respectively.

Table 6.2 Results and analysis (British)

Raw Data (British)

	OA			RAW DATA				SITE
1	1	1	1	80	76	76	86	RBS
2	1	2	2	72	76	41	67	AN
3	2	1	2	63	61	51	81	BM
4	2	2	1	58	35	37	39	BAN

Optimum (British)

FACTOR	OPT. LEVEL DESCRIPTION	OPT LEVEL	CONTRIBUTION
Info	Detailed	1	9.312
Focus	User	1	9.312
Style	Graphics	2	1.562
Total contribution from all factors			20.185
Grand average of performance			62.437
Expected optimum results			82.623

ANOVA (British) Fcrit 1,12(0.05) = 4.75 , Fcrit 1,12(0.01) = 9.33

FACTOR	DF	SUM OF SQUARES (S)	VARIANCE (V)	F RATIO	PURE SUM (S')	PERCENT (%)
Info	1	1387.5	1387.5	10.27	1252.5	28.249
Focus	1	1387.5	1387.5	10.27	1252.5	28.249
Style	1	39.06	39.06	0.289	0	0
Other	12	1619.7	134.97	-------	--------	43.502
Total	15	4433.9	---------	-------	---------	100

Table 6.3 Results and analysis (Chinese)

Raw Data (Chinese)

	OA			RAW DATA				SITE
1	1	1	1	76	68	79	60	RBS
2	1	2	2	73	45	62	66	AN
3	2	1	2	67	65	64	65	BM
4	2	2	1	59	39	57	48	BAN

Optimum (Chinese)

FACTOR	OPT. LEVEL DESCRIPTION	OPT. LEVEL	CONTRIBUTION
Info	Detailed	1	4.062
Focus	User	1	5.937
Style	Graphics	2	1.312
Total contribution from all factors			11.31
Grand average of performance			62.062
Expected optimum results			73.373

ANOVA (Chinese) Fcrit 1,12(0.05) = 4.75, Fcrit 1,12(0.01) = 9.33

FACTOR	DF	SUM OF SQUARES (S)	VARIANCE (V)	F RATIO	PURE SUM (S')	PERCENT (%)
Info	1	264.06	264.062	3.515	188.96	10.754
Focus	1	564.06	564.062	7.51	488.96	27.830
Style	1	27.56	27.562	0.366	0	0
Other	12	901.24	75.104	-------	---------	61.416
Total	15	1756.9	---------	-------	---------	100

The 'ANOVA' section provides the percentage contribution that each of the web site factors made together with the F ratios. The percentage contribution of the 'other / error' term (43.502 for British and 61.416 for Chinese) might at first seem to be large. This is however not the case. The 'other / error' term represents all the other variables within the four web sites apart from information, focus and style (structure, methods of navigation, download time for example), and all other differences within the users apart from age, gender and expertise (personality and cognitive differences for example). Experience of using Taguchi methods for usability analysis indicates that the 'other / error' term in this study is actually

relatively low, thereby highlighting the reliability of the results.

In the OWL/Accenture study the British user group was found to prefer *detailed* information, *user* focus and *graphical* style – although style was not statistically significant. Contrary to possible expectations, style (e.g. graphics / animation) is not important for young male experts (although possibly preferred). Information (detailed) and focus (user) are however significant and important (28%). The three factors account for 56% of variability, which is a high (i.e. good) value for experiments of this type showing that they were important in effecting user preferences.

In the study undertaken as part of this thesis, the Chinese users also preferred *detailed* information, *user* focus and *graphical* style – although again style was not statistically significant and information less so. Again contrary to possible expectations style (e.g. graphics / animation) is not important for young male experts (although possibly preferred). The three factors account for 39% of variability, which although still acceptable for this type of experiment, is less than the 59% for UK users implying that other issues unrelated to information, focus and style might be more important for Chinese users.

It was found that both British and Chinese young male expert users indicated a preference for detailed information, within a user focused and graphical environment. However any preference for graphics is extremely small and certainly in no way statistically significant. As shown in Figure 6.2 the relative importance of the factors does show some interesting differences. Although both British and Chinese user groups indicate that a detailed user focus represents a 28% contribution to their assessment of the sites, in the case of detailed information the contribution for Chinese users (11%) is well under half that of UK users (28%).

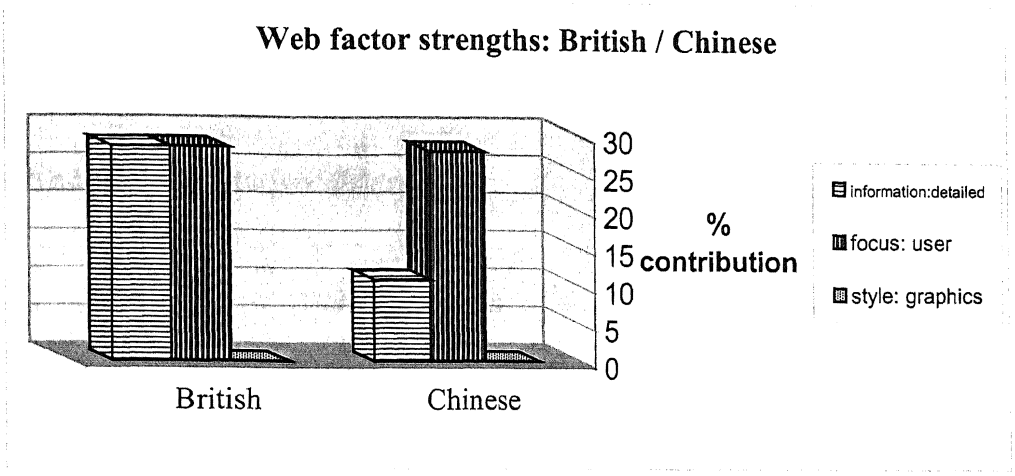


Figure 6.2: Comparison of results

6.5 Study C: conclusions and discussions

Firstly, it should be emphasised that this study presents some detailed quantitative analysis of usability differences between two cultural groups. Furthermore it provides support for the validity of some of the earlier work on the use of Taguchi methods in this context (e.g. Smith and Dunckley, 1998). Taguchi methods offer considerable potential to researchers interested in cultural diversity as they minimise the amount of costly user testing required (Dunckley and Smith, 2000).

Secondly, results for this study indicate that both user groups the web site to be *user focus*, that means the supporting for user to find e-finance information seems to be an important issue for both British and Chinese users.

In relation to the outcomes of this study and their relevance to a fuller understanding of cultural diversity and HCI activities, the results show significant differences between British and Chinese male expert users in one key area: Chinese users had a *lower preference* for detailed eFinance product information (product differentiation) as compared to British users. More detailed, situated and controlled experiments will be conducted later to explore these issues.

It is possible to tentatively postulate that the limited difference that have been shown is due to either / or product presentation differences and consumer product familiarity differences.

6.5.1 Product presentation differences

Choong and Salvendy (1998) and others have proposed that fundamental differences between the written form of English and Chinese languages such as Mandarin and Cantonese, could have implications for some key cognitive abilities. English is an alphabetic language in which the graphical unit represents *phonemes,* whilst Chinese languages are *morphemic* i.e. the graphical unit (a character) almost always represents a morpheme. The complex orthography of these written language forms represents a challenging learning path. Choong and Salvendy found that Chinese learners tend to have superior pictorial visual discrimination abilities as compared to English speakers. Their greater ability to discriminate visual patterns as opposed to textual patterns seems to be facilitated by learning languages such as Mandarin. From the results of Study D in Chapter 7 (Chinese users are more interesting in *form* which relates to the appearance or style of the page, whereas British users are more concerned with *content* which relates to the information contained within the page), a hypothesis could be proposed that this greater visual acuity of Chinese users, might influence their preference towards graphical, as opposed to text-based product descriptions. Further work is possible to follow up this promising area by exploring eFinance sites in order to determine what kinds of detailed financial product information are preferred in graphical or iconic forms and which are preferred in textual forms.

6.5.2 Product familiarity differences

Work in the semiotic analysis of web sites (Andersen, 1997, French et al.1999, Vile et al. 2000) has established that web users receive and apply meanings to a web-site, depending on a number of interrelated semiotic 'layers' as shown in

Figure 6.3.

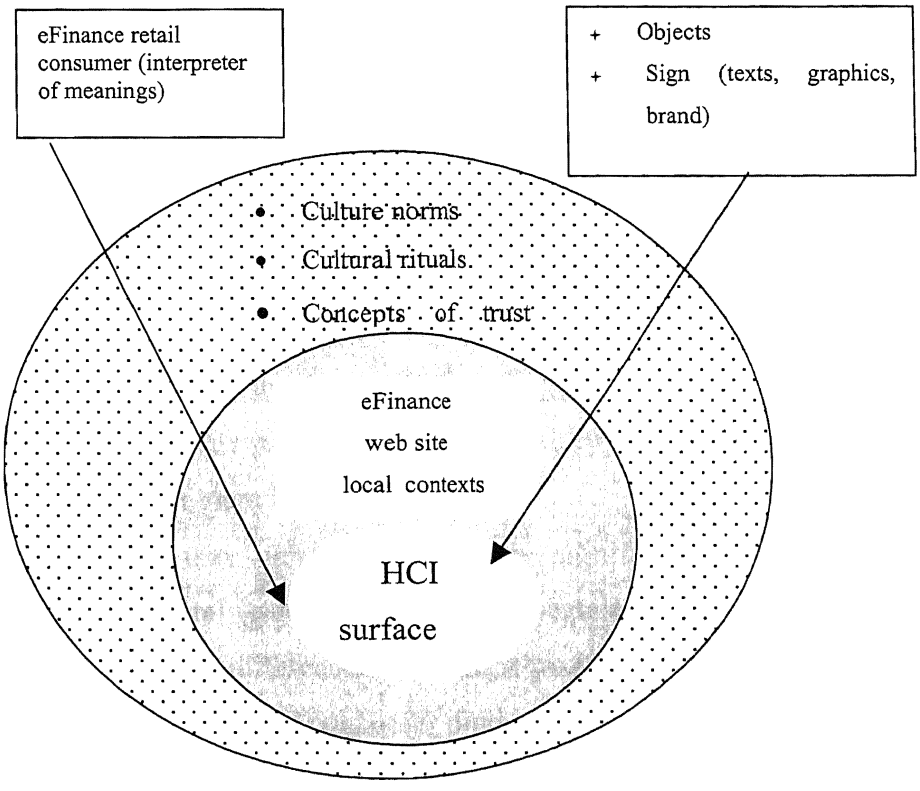


Figure 6.3: Consumer received meanings and semiotic layers

To some extent the difference found between Chinese and the UK eFinance users could be as a result of differences in interpretation of concepts such as 'loan, 'repayment', 'mortgage', 'credit' i.e. the 'local contextual cues that are evident. That is to say, the Chinese users are simply not expecting to need to assimilate detailed eFinance product information before making a decision to borrow money because such products and loans are more commonly family negotiated, rather than institution led. This has implications for those eFinance players considering entering the Asia-Pacific region: they may need to consider localisation from an architectural, strategic as well as a semiotic perspective if they are to be successful (Vile *et. al.* 2000).

It could also be postulated that Chinese web site users may be adopting a generic 'holistic' preference (i.e. headline company 'brand-led' and key product led) for web-site content as compared with British users. British users as operating within highly developed markets are more willing to research and interpret detailed web-based information. That is to say, they may be showing differential attraction to brand 'signs' operating at the innermost semiotic layer.

Summary

In this Chapter:

- A pilot empirical study that adopted Taguchi methods to investigate differences in web site usability and acceptability between users from China and the United Kingdom has been reported;
- Results indicate that although there are significant similarities, some differences in cultural issues and semiotic aspects exist between Chinese and British web user, the differences have been postulated to either / or product presentation differences and consumer product familiarity differences.

Chapter 7

Using card sorting and semiotic analysis to evaluate cross-cultural web acceptance

Chapter objectives

This Chapter adopts *card sorting* and *semiotic analysis* as tools for investigating comparative cross-cultural web acceptability of both Chinese and British users.

7.1. Introduction

In this thesis *cross-cultural web acceptability* refers to the extent to which a web site delivers a user experience that matches local cultural needs and thereby leads to high levels of adoption (Smith and Chang, 2003). The primary purpose of the studies described in the chapter is to identify the following issues associated with cross-cultural web acceptance.

In order to understand how and why users reject or accept a web site, it is necessary to engage the users in their evaluation / acceptance process, and thereby to elicit the relevant knowledge that they bring to bear to their evaluation / acceptance process. Maiden and Rugg (1996) describe types of knowledge in terms of its accessibility for elicitation. They describe *semi-tacit* knowledge along with the traditional distinction between *tacit* and *non-tacit* knowledge. Tacit knowledge is only available through observation. Non-tacit knowledge can be probed by direct questioning. Maiden and Rugg describe *semi-tacit* as a third category, in which certain knowledge types are identified as accessible but through indirect probes only.

In cross-cultural web acceptability studies, where users come from different cultures, much of the insight for interaction-generated information can only

obtained by directly observation or questioning. Furthermore, *semi-tacit* knowledge needs to be probed. To identify the spaces in which semi-tacit knowledge resides, and the ways in which it is generated, *card sorting* and *semiotics analysis* are proposed as methods to be tapped and deployed. The next sections will look at each in turn.

7.2 Study D: card sorting

7.2.1 Introduction

Card sorting was originally used within personal construct psychology (Kelly, 1955) which is based on the belief that people make sense of the world by categorising it, and that people can describe their own categorisation of world with reasonable validity and reliability. *Categories* are an important part of an individual's knowledge. Card sorting is suitable for gaining relevant information inspired by a number of diverse experiences. Such information is likely to be difficult to access due to its diverse nature. Card sorting often generates rich data about the respondents' categorisation of the domain under investigation, and design, execution and analysis of results can be completed in a relatively short time (Rugg and McGeorge, 1997). Card sorting also offer interesting possibilities in the task of eliciting cross-cultural perceptions (Hurd, 2001).

Card sorting methods have already been used successfully in the elicitation of web page site user data (Upchurch et al, 2001). It is a method, which is simply explained to respondents, making comparatively low demands on their linguistic ability – responses need not be grammatically or even lexically correct, just intelligible. This renders it particularly suitable for use where data collection sessions need to be conducted in the respondents' second language.

Card sorting has also been successfully used in requirements capture and more recently in assessing culturally diverse user interpretation of 'signs' presented on

web sites. A further example is Laddering (Rugg and McGeorge 1995), which has been used by to generate specified referential frames that systematically externalise users personal constructs.

7.2.2 Aims of study D

The primary purpose of using card sorting, is to identity the following issues in cross-cultural web acceptance

i. The significant attributes of interests, that is the specific properties of a web page that users within specific region /culture could provide;

ii. The preferred values of the measurement that users would indicate of quality within specific regional / cultural backgrounds.

7.2.3 Study D: methodology

In this study, respondents were asked to repeatedly sort cards, which carried screen shots of selected web homepages. They were then asked to generate their own criteria for the sorting. They categorised the cards into different categories according to criteria they had already generated. The respondents included two groups, 10 male and female Chinese users who were located in Beijing and other cities in China, and equally 10 male and female British users who located in Luton, U.K. The card sorting study was planned through the following steps:

- *Choosing the appropriate card sorting approach,* picture sorting was used which would involve the sorting of screen shot of web site home pages.

- *Decide which entities to use,* here the analysis of five different screen dumps

of different web site is discussed, each screen dump contained visual and textural information ;

- *Sorting the same set of cards repeatedly, using repeated single criterion for the sorting each time,* in this study, repeated single criterion sorts were chosen, which meant that the respondents sort the same entities repeatedly, categorising in terms of a different single attribute ('criterion') each time.

During each test, respondents were asked to sort the cards. In each sort, respondents firstly chose a construct in order to evaluate the cards and then placed them into groups (categories) according to that construct, no constructs were provided by the moderator. This process was then repeated until each respondent was unable to generate any more constructs with which to sort the cards. Any evaluative comments made by the respondents regarding the web sites or the constructs used in sorting were noted.

Card sorting method is illustrated in Figure 7. 1.

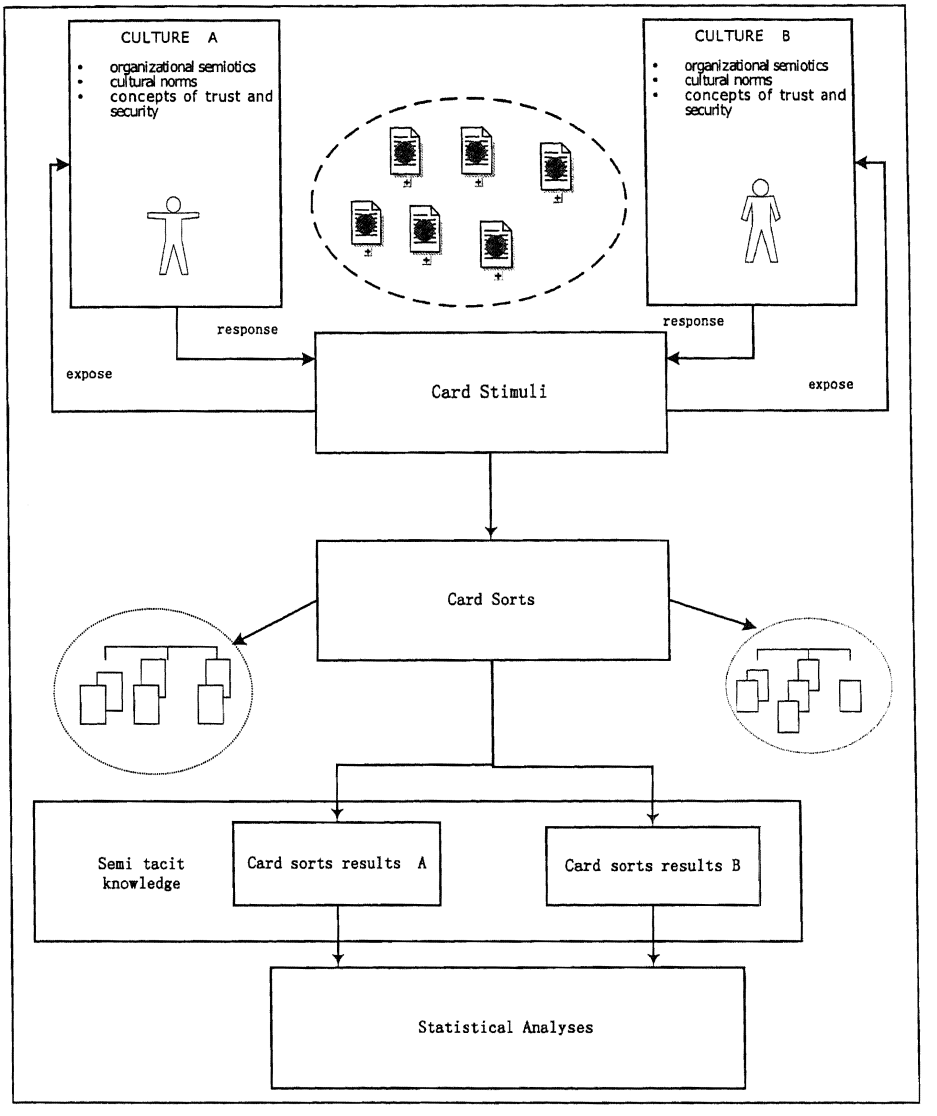


Figure 7.1: Card sorting method

7.2.4 Study D: data analysis and results

a) Number of Criteria generated

The number of criteria the respondent used and the member of groups used within

each criterion is one way to begin to analyse differences between the two user groups (British and Chinese). This can serve to roughly indicate expertise, because in general the more experience the respondent has, the more criteria the respondent can generate.

Table 7. 1: Criteria generated by different groups

	Chinese users	**British users**
Number of respondent per group	10	10
Minimum criteria per respondent	3	4
Maximum criteria per respondent	5	5
Mean of criteria	3.9	4.7
Std. Deviation	0.876	0.675
Total number of criteria	**39**	**45**

Table 7. 2: ANOVA analysis for number of criteria generated

	Sum of Squares	**DF**	**Mean Square**	**F**	**SIG.**
Between Groups	3.200	1	3.200	5.236	**0.034***
Within Groups	11.000	18	.611		
Total	14.200	19			

Results from Table 7.1 show that British users constructed more criteria than Chinese users. Furthermore the ANOVA analysis provided in Table 7.2 indicates that the number of criterion generated by the two groups are significantly ($p< 0.10$) different.

b) Number of super-ordinate respondents constructed

This stage involves agreement (commonality) between groups of respondents. Once the verbatim (where different respondents use exactly the same words) and initial gist (where different respondents use different words for the same thing) agreement has been analysed, the criteria or categories can be grouped into super-ordinate (high level) constructs.

Table 7.3: Number of categories constructed by super-ordinate

Super-ordinate construct	Chinese	British
Style	2	5
Art Design	2	2
Layout	3	6
Navigation	1	8
Colour	10	6
Contents	10	8
Impact	8	10
Target / usage	3	2
Total	**39**	**47**

Table 7.3 shows that British users are more concerned with *style*, *layout* and *navigation*, thus they generated more sub categories in these super-ordinate categories; whereas Chinese users are more concern with *colour* and *contents*. Most of British users regarded *usability* as a very important issue when they construed the category, but Chinese users rarely mentioned those issues related to usability.

c) Hierarchy Comparison Analysis

Having the criteria and categories generated by different groups of users, it is possible to use classification schemes to draw hierarchies for different users groups, and compare them. The higher up the hierarchy, the more abstract and general the categories are likely to be used by the respondents. It is also a valuable tool for it clearly indicates the commonality or differences that the two groups have. Parts of hierarchies are concerning for *art design* and *navigation* constructed by British and Chinese users is showed in Figure 7.2. From the structure tree diagram, some of the differences have emerged:

(i) Chinese users constructed more categories concerning to *art design* and *colour*, whereas British users constructed more concerning to *navigation*

and *contents*. So we assume that Chinese users are more interested in *form* (relating to the appearance or style of the page), whereas British users are more concerned with *content* (relating to the information contained within the page).

(ii) *Navigation* was ignored by most of the Chinese users. Although most of the British users mentioned part of usability issues like efficiency of navigation and satisfaction, but Chinese user seems to ignore those issues unconsciously. This may due to lack of usability education in China and usability is not a mature concept for most of Chinese users.

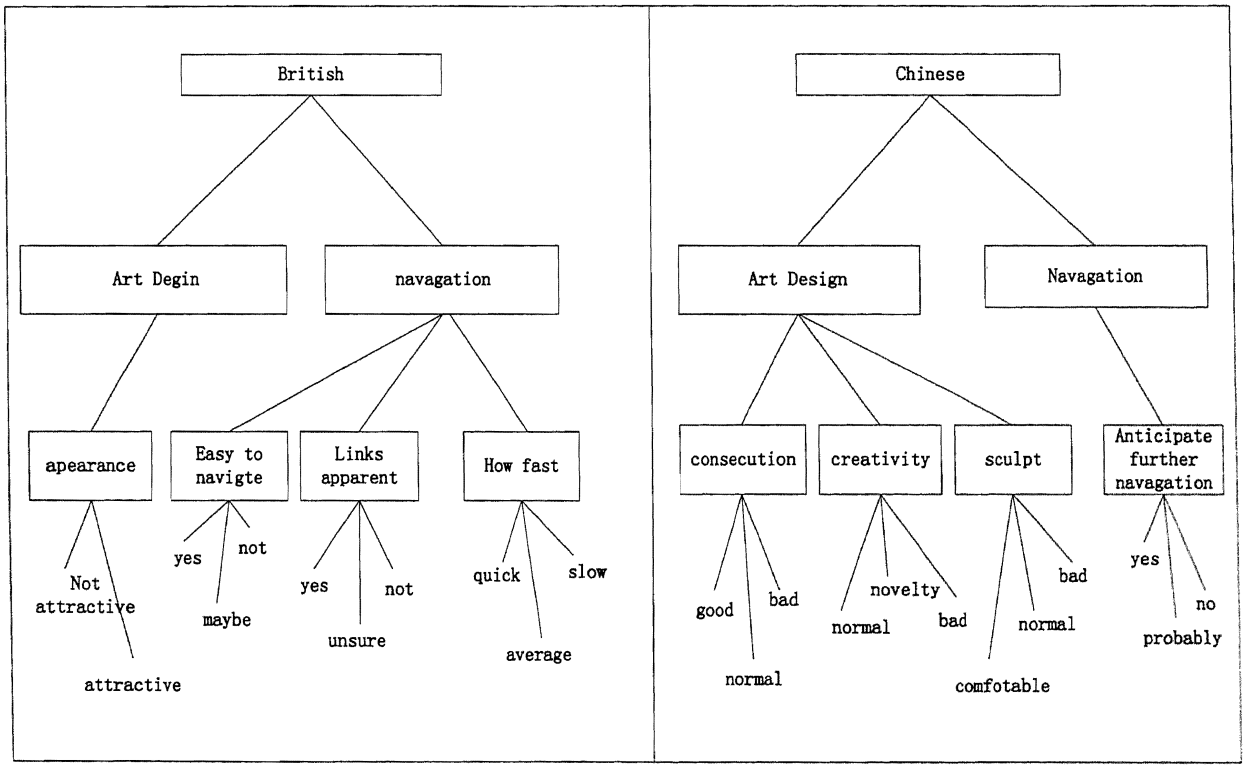


Figure 7.2: Hierarchies constructed by British (left) and Chinese (right)

d) Primary quality analysis

At the end of the study, respondents were asked to evaluate each of the web sites represented on the cards in response to the question, 'How good does the web site

seem to be?' and to mark their assessment on a Likert-type scale. The wording 'How good does the web site seem to be?' was preferred to any construction using the word 'quality' for two reasons. First, it permitted a simpler sentence construction than would otherwise be possible: this would avoid the risk of misinterpretation by respondents whose first language was not English. Secondly, the word 'Quality' is a sophisticated construct, which may be vested with a variety of connotations and meanings in different cultures.

Screen-shot of the five testing cards are shown in Figure 7.3.

Results in Table 7.4 indicate that different group of respondents gave different value (quality) to different cards.

Table 7. 4: Score for each card

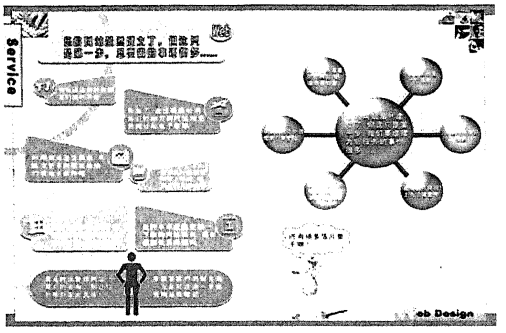
		Card 1	Card 2	Card 3	Card 4	Card 5
British Users	Mean	5.19	6.44	**7.38**	4.69	**3.94**
	Std. Deviation	2.203	1.545	1.768	1.751	2.542
Chinese Users	Mean	5.13	**8.13**	7.63	**4.63**	7.25
	Std. Deviation	1.885	1.642	1.061	1.768	1.581

For the British users, Card 3 got the highest mean score (7.38) whereas Card 5 got the lowest mean score (3.94). On the other hand, Chinese users gave highest mean score (8.13) to Card 2 but scored Card 4 the lowest mean score (4.63). The reasons will be discussed in the following sections.

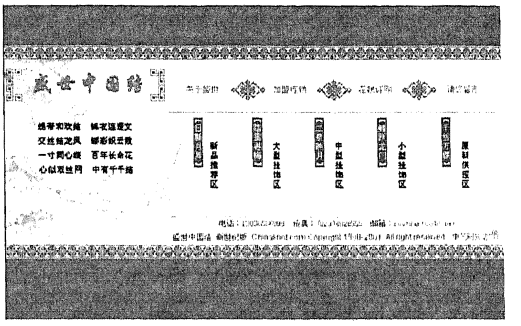
e) Feature Comparing by groups

Various of features proposed by different groups of users (Table 7.5 for British users; Table 7.6 for Chinese users also help us to identify the characteristic of different cards.

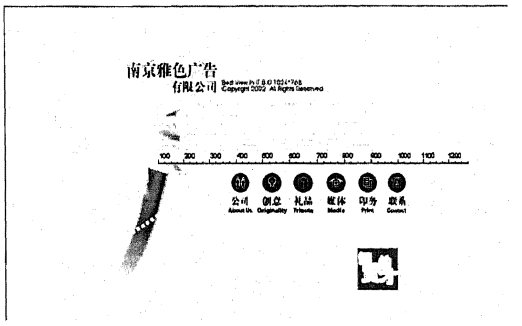
Card 1



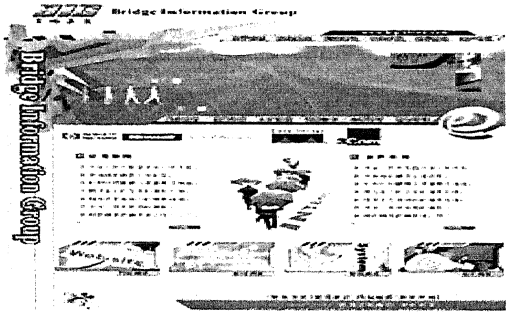
Card 2



Card 3



Card 4



Card 5

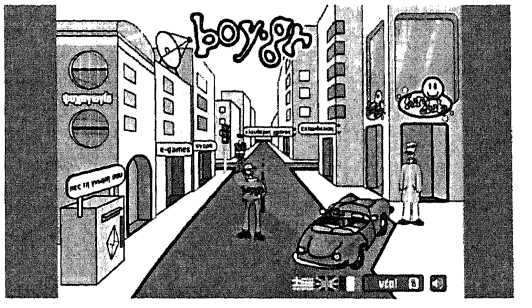


Figure 7.3: Five testing cards

Table 7. 5: Feature of the Cards (British Users)

FEATURE		CARD 1	CARD 2	CARD 3	CARD 4	CARD 5
Style	Formal		Formal	Formal	informal	informal
	Orientation	modern	Traditional (4)	Modern(2) traditional	Traditional(3)/ modern(1)	Modern (2)
Art Design	Appearance		attractiveness	attractiveness		
	popular design				Very pop design	Very pop design
	Feeling	fussy	vivid	vivid		vivid
Layout	Balance	simple	balanced	Simple layout	fussy	
	Organisation	cluttered			Cluttered(4) random	Cluttered(5)
	Use of space		Good use of space			Good use of space
Content	Language	Chinese (English)	Chinese	Mixture of Engl. /Chi.	Chinese	Greek
	Metaphor	iconic	Cue card	iconic	Cue card	iconic
	Info. Provided			Not clear of information	Clear of infor.	
	Easy to understand			Good understand	Good understand	
	Contrast colour/text		High contrast C/T	High contrast C/T	High contrast C/T	High contrast C/T
	Use of image/text	More image	More text	More text	More image	More image
Impact	Significant memory					
	Trust		trust	Trust(2)	trust	
	Favour					
Colour	Feeling		Like the colour	Like the colour	dull	
	Colour usage	Too many colours	Good match(2), bright	Sparing use, bright	Sparing use	Too many colours bright
	Colour Scheme		Good colour scheme	Conflict colour scheme		
Navigation	Links			Apparent links		
	Efficiency of use	efficiency				efficiency
	Navigation speed	immediate	quick	immediate	slow	slow
Av. Score		5.19	6.44	7.38	4.69	3.94
Std. Deviation		2.20	1.54	1.77	1.75	2.54

Table 7. 6: Feature of the Cards (Chinese Users)

FEATURE		CARD1	CARD2	CARD3	CARD4	CARD5
Style	Orientation	modern	Traditional	Traditional	Traditional	modern
Art Design	Complexity	Complex design(2)	Complex design	Simple design	Complex design(2)	Complex design
	Consecution	Not consecution	Consecution design	Consecution design		Not consecution
	Definition	Bad definition	Good definition		Bad definition	
	Creativity		novelty	novelty		novelty
	Feeling	abstract	visual	abstract	visual	visual
Layout	Distance	far	close			close
	Agreement	Bad organised			Bad organised	Organised well
Content	Language	Chinese (English)	Chinese	Mixture of Engl. / Chin.	Chinese	Greek
	Info. acquirement	Difficult find information	Find information easily		Difficult find information	Find information easily
	Metaphor	movie	Theatre	TV	movie	Theatre
Impact	Attractiveness	attractive	Attractive(2)	attractive		Attractive(3)
	Emotion	personal	exciting	personal	personal	calm
	Practical		practical		practical	
Target usage	Type	service	products	Product and service	Product and service	Entertainment
	Page suitable for		homepage	homepage	homepage	enterprise
	Web function	portal	enterprise	enterprise	portal	commercial
Colour	Hue(main)		red	yellow	blue	
	Background colour	White background	Red background	Yellow background	White background	
	Feeling	Dislike the colour	lovely		lovely	lovely
	Hue contrast		warm	warm		cold
	Mixture of colour			Good colour mixture		
Av.Score		5.13	8.13	7.63	4.63	7.25
Std. Deviation		1.88	1.64	1.06	1.77	1.58

Card 3 became British users' favourite site because of looks formal, vivid and attractive, consists of clear information and adopts good use of English and Chinese. Also it is easy to use and could engender trust, etc. In contrast, Card 5 gained the lowest score from British users because it is not a English site, the product is not clear and was supposed to be slow to download (3D structure), not efficient to use (user were get lost), etc. Chinese users, however, regarded Card 2 as their favourite site due to its traditional (oriental) style, concise design and clear of information. It also looks attractive and exciting for its high use of red colour. On the other hand, complex design, poor organisation, unclear information bad definition led Card 4 to gain lowest score by Chinese users. It is also interesting to note that Card 5, a Greek site, won second highest mean score by Chinese users but gained the lowest score by British users.

It is unclear which cultural characteristics may be leading to these significant differences between Chinese and British users. Therefore, based on card sorting study, further cultural characterises investigation by *semiotic analysis* will be carried on in next section.

7.3 Study E: Semiotic analysis

7.3.1 introduction

As mentioned in Chapter 2, *semiotics* - the "science of signs and shared meanings" is the discipline, which connects meaning, meaning making, communication and culture through an understanding of acts of significant.

Semiotics focuses on signs. Signs and sign processes are its object domain. Signs pertaining to our senses (visual, aural, oral, tactile, and even olfactory) underpin HCI, therefore there have been various attempts to apply the semiotic paradigm to the field of IT and HCI. Semiotics also offers a sound theoretical basis for which practitioners can use to manage, design and build adaptive and commercially exploitable WWW solutions. Sowa (1999) claimed with justification that the

Internet is a giant semiotic system.

Semiotic analysis (SA) offers a supplemental way of eliciting cross-cultural acceptability by focussing on the semantics ('meaning') that an interface (intended and unintended) transmits. It provides an effective way of exploring the core features of a web site by checking whether or not the web sites which are semiologically valid, which engender trust and security, and which are culturally suitable. The fundamental notion is that stakeholders give meaning to signs through acts of signification called *semiosis*. Semiosis can be viewed as a potentially infinite process, often involving the assignment of multiple meanings to a given stimuli. The process has been shown to be dependent on the context within which acts of meaning making occur as well as an actor's role, cultural origin and individual cognition.

Semiotics offers a useful vantage point from which to observe this discourse by characterising an individual user's reaction to devices by *semiosis* and characterising users responding as part of a defined social groups. This highly variable process of meaning making serves to mediate all acts of human communication. These acts of communication typically comprise communication patters, social rituals and norms, speech acts, social constructs of various kinds and at the concrete level ultimately influences people's perceptions of computer based signs embedded in a computer interface. Signs typically take the form of tangible visual concrete stimuli (such as icons, images, hypertext cues etc) as well as are expressed as social constructs (shared knowledge). Signs can also take form of more abstract meaning making suck as beliefs, culture and trust. Therefore, semiotics also offer two related cross-cultural approaches to web development (French and Smith, 2000):

1. ***Contextual HCI Semiotics***: it is recognised that meanings embedded in an interface cannot be fully shared. Users often draw their cues from the contextual features present in their local environment, and it is possible to analysis the context within the system, thus matching signs to context and prompting 'shared meanings';

2. ***Web interface semiotics*:** generic cross-cultural factors influence the choice and interpretation of colour, meanings of icons, symbols and interpretation of so called ' universally understood' signs.

7.3.2 Aims of study E

Acting as a supplemental process to that of card sorting, semiotic analysis is used in study E, which presents a novel paradigm for 'discovering' or rather revealing semi-tacit knowledge, hidden user requirements, expectations and specific cultural characteristics in web acceptance.

7.3.3 Study E: methodology

Semiotics analysis (illustrated in Figure 7.4) mainly involves expert based indigenous site auditing, concentrating on what might be loosely called the general "look and feel" (i.e. meta-level stylistics) of an interface as well as detailed design elements such as choice of specific content. Semiotics analysis contains three main steps:

(1) Users based card stimuli.

This mainly involves the card sorting process, which has been described in study D. Through card sorting study, semiotics experts could get first hand of information which concerning the specific properties and the values of the quality measurement for a card, which comes from user within specific region /culture.

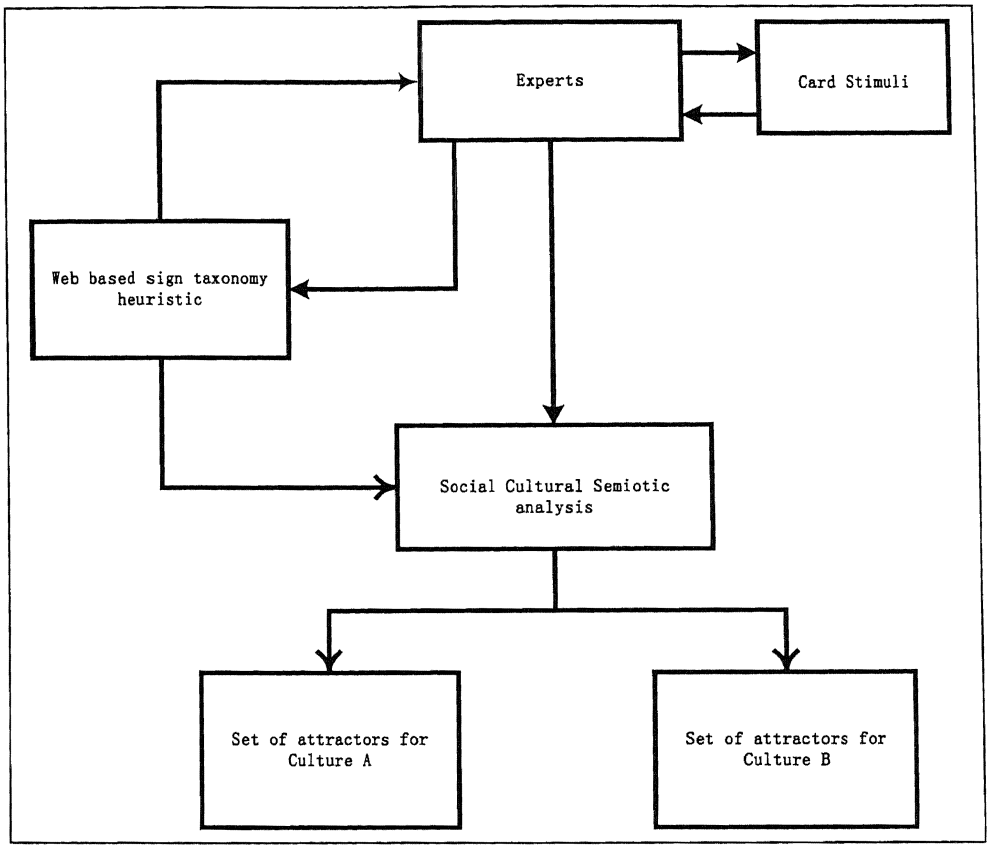


Figure 7.4: Semiotic analysis methods

(2) *Web based sign taxonomy heuristic*

Web-based sign is an expansion from computer based sign to the web context. Andersen's work (1990) of Computer-based sign uses semiotics to analyse and design systems for use. For Andersen, the important difference between the system model and the user's simply signifies two interpretations of the same sign-complex produced by two groups that access different parts of it (designer and user). Thus, computer semiotics sometimes enforces a reinterpretation of technical issues, e.g. many processes which computer science sees as data storage and retrieval are really communicative processes from a semiotic point of view. A computer based sign in the web context indicates: a textual cue, a colour, an image, an icon, a navigation cue, or an advert. Web based signs can also be called

as *web-site attractors*. (Fink, 1999). Based on previous work (Krug, S. 2000; French, 2003), a typical taxonomy of web based sings could be summariesd as following:

- **Web narrative (Composite narrative)**: lengthy textual narrative
- **Brand signs:** signs contain information, which may relate to brand.
- **Tagline:** a pithy phrase. It is a phrase that is visually connect to the ID and characterises the whole enterprise, summing up what it is and what makes it great. Read it as a description of the whole site.
- **Identity & mission**: the homepage has to tell users what site this is and what it is for, and if possible, why users should be there and not at some other site.
- **Search:** most sites have a prominently displayed search box on the home page to help users find relevant information.
- **Deals and feature promotion**: homepage space needs to be allocated for whatever advertising. Cross-promotion and co-branding deals have been made.
- **Hierarchy**: page has to give an overview of what the site has to offer-both contents (" What can I find here?") and features (" What can I do here?")- And how it's all organised. This is usually handled by the persistent navigation features.
- **Iconic (Image/ video/animation):** issues relating to iconic.
- **Timely contents:** If the success of the site depends on users coming back often, the home page probably needs to have some content that gets updated frequently. And even a site that doesn't need regular visitors need s some signs of life-even if it's only a link to a recent press release- to signal users that its not moribund.
- **Hypertext navigation controls:** single and embedded signs.
- **Security link**: hypertext navigation controlling an embedded item on visually prominent horizontal navigation bar.
- **Registration:** If the site user registration, the home page needs links for new users to register and for old users to sign in, and a way to let me know that I 'm signed in.
- **Short cuts**: the most frequency requested pieces of content (software update,

for instance) may deserve their own links on the homepage so people do not have to hunt for them.

- **Terms & conditions**: A lengthy and somewhat tediously detailed legalistic statement of terms and conditions appended to homepage.
- **Affiliations**: company registration numbers, affiliation, regulatory bodies, etc.

The process for *web based sign taxonomy heuristic* should be carried out by a usability expert who has a good understanding and experiences for web based signs. It seeks to align a novel application to a user's normative whole-world "sign" experience. From a semiotic viewpoint, an interface is essentially a self-referential symbolic sign system that is ultimately decoded (or rather interpreted) by a set of users. W*eb based sign taxonomy heuristic* attempts to separate out the following features of a web interface (French et al., 1999):

- The intrinsic meanings inherently present within the symbolic system;
- The perceived meaning as decoded by a particular set of users;
- The meaning which a particular context may endow to an interface and a set of users.

After web based sign *taxonomy* auditing, features of a specific card (web site) could be further revealed.

(3) Social cultural semiotic analyse

Semioticians (semiotic experts) view an interface as a self-consistent sign system which is intrinsically capable of being differentially decoded by users depending on a user's cultural background, together with a whole host of other influencing factors. Semiotics does not recognize that any particular sign is truly 'universal' – it all rather depends on context, both local and global.

An analysis of the social and cultural factor relating to web-base signs can reveal contemporary wider social and cultural phenomena. Previous studies have clearly

established that these surface level features are indeed differentially perceived across linguistic and cultural boundaries (Fink and Lapause 1999). For example, trust aspects have previously been shown to be differentially perceived across cultural boundaries (Jarvenpaa and Trackinsky, 2000). Therefore, the strength of semiotic analysis lies in its ability not only to infer cultural factors from signs embedded in texts, but also from its ability to embrace signification operating at social, organisational and workgroup level (Prates et al, 1997)

Towards gaining a deeper understanding of how to develop web sites, that are optimally matched to both its target audience and to its domain (e.g. e-finance, e-commerce), it is necessary to investigate the different signs in a local culture, their context of use, and the meanings that the locals attribute to them. This can be achieved by conducting an audit of local indigenous sites.

Typically, an audit would be carried out by a usability expert who belongs to that target culture, or has a good understanding of that culture via first-hand personal experiences, or through extended family or friends. The audit would involve evaluating prominent and successful local web sites that are considered to be typical exemplars in the domain of interest or in related domains, with a view to identifying the use of specific *cultural attractors*.

Cultural attractors could be defined as the interface design elements of the web site that reflect the signs and their meanings to match the expectations of the local culture. The cultural attractors typically comprise of: colours, colour combinations, banner adverts, trust signs, use of metaphor, language cues, currency formats, navigation controls and similar visual elements that together create a 'look and feel' to match the cultural expectations of the users for that particular domain. Those Cultural attractors can be conveniently assembled into the following loose meta-level taxonomy:

- Use of colour and colour combinations

- Use of culturally specific symbols
- Linguistic cues (mixed, dual language and assimilation of one language into another)
- Culturally specific iconography (religious and charity giving, cartoon, geographical)
- Trust aspects as instantiated in site branding and signification.

Although it is proposed here that the identification and analysis of *cultural attractors* holds promise for better cultural optimisation, little has thus far has been published concerning the relationship between specific cultural attractors and cultural phenomena operating in specific cultures.

7.3.4 Study E: data analysis and results

(1) *Web based sign taxonomy heuristic*

Based on taxonomies of web based signs, the results of web based sign auditing for 5 test cards are shown in Table 7.7.

Table 7.7: Web based sign analysis

	CARD 1	CARD2	CARD3	CARD4	CARD5
Web Narrative	Yes	Yes	Yes	Yes	Yes
Brand Signs	No	Yes	Yes	Yes	No
Identity & Mission	Yes	Yes	Yes	Yes	No
Iconic (Image/ video/animation)	Yes	Yes	Yes	Yes	Yes
Hypertext navigation controls	Yes	Yes	Yes	Yes	Yes
Search	No	Yes	No	No	No
Timely contents	No	Yes	Yes	Yes	No
Terms & Conditions	No	Yes	Yes	Yes	No
Affiliations	No	Yes	Yes	Yes	Yes
British (Mean)	5.19	6.44	7.38	4.69	3.94
Chinese(Mean)	5.13	8.13	7.63	4.63	7.25

Results indicate that Card 2 and Card3 contain more web-based sign than other cards. Their won higher mean scores by both Chinese and British users.

(2) *Social cultural semiotic analyse*

In order to establish some links between specific site signification and some cultural factors, an informal *social cultural Semiotic Analysis* of web-based signs embedded within cultural context has been carried by Chinese and British experts respectively. In order to give an example of the kind of approach, two prominent cards from British and Chinese users respectively in Card sorting study have been audited in detail (Table7.8 and Table 7.9). In this analysis, some specific cultural attractors have been embedded into these sites, to wider cultural phenomena.

From *Social cultural semiotic analysis*, some of the important issues emerged:

(1) For Chinese user, the red colour means happiness and fortunate, Card 2 uses red as a background colour. This is one important factor that led this card to gain highest score. In contrast, the red colour would mean dangerous in the British culture.

2) Trust could be another important factor. Web sites (Card 2 and Card 3) with high emphasis on trust, could gain higher score from web users.

3) The study also evidenced that cultural attactors could heavily affect different groups of users' attitude toward web sites. Therefore, cultural attators should be regarded as an important interface design element, which could reflect the sign and their meaning to match the expectation for the specific culture.

Table 7.8: Semiotic analysis of cultural attractors for card3 (British)

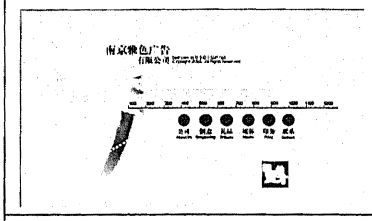
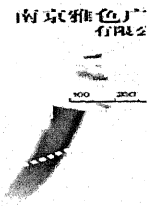
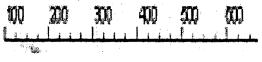
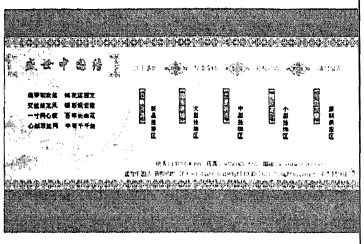
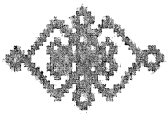
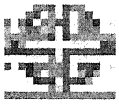
British web site attractors		
Web site	Attractors	Rationale
	Colour are yellow, white, black and green	High Contrast. Actively, lively, and modern.
A advertisement company		Daffodil : National flower of Wales also means gentleness and growth. It is the national flower of Wales because it blooms on 1st March, the feast day of the patron saint of Wales, St. David. The daffodil is the American Cancer Society's symbol of hope that a cure for cancer will be found. They believe it symbolises new hope and life.
		Using numbers indicates it is a digital era. Also when scanning the number from left to right, the whole page seems to be moving.
		Combining icon with text (Chinese and English). So simple, easy to understand. Cognise rather than remember.

Table 7.9: Semiotic analysis of cultural attractors for card2 (Chinese)

Chinese web site attractors		
Web site	Attractors	Rationale
		The sign is called column bracket, which is widely used in ancient Chinese architecture as decorated archway, plaque and horizontal inscribed board.
A Chinese decoration company		Knots. In Chinese language, "knot" has the meanings of reunion, friendliness, warm, marriage, love etc. In addition, "knot" and "luck, felicity" have the same pronunciation, so Chinese knots are often used to express some good wish including happy, prosper, love and no evil.
Products: Traditional Chinese decoration knots, also known as Chinese Knots, are typical local arts of China. This hand-tied knot, a fine art, is evolved from the knots used in daily life through thousands of years.		The is the transaction of Chinese Character "Shou" which means long life or live forever. This Character is widely used in Chines decoration for the best wishes.
Chinese Knotting has decorated both the fixtures of palace halls and the daily implements of countryside households. It has appeared also in paintings, sculptures, and other pieces of folk art.		Plum Blossom as a simple and contemporary interpretation of an elegant, traditional theme. The plum blossom blooms in the Winter (February) and appears without leaves. This flower therefore represents strength under adversity. Plum blossom is the official flower of China, people traditionally view it in early spring each year. Therefore the flowers represent best signify the arrival of spring
	Colour and Background colour are Red Text : Black	Contrast of hue. Same hues are used in the theme and background colour. Feeling of stable, unity and traditional.
	Text ordered from top to bottom	Traditional style of Chinese character order.

4) The design of Card2 is based on a traditional Chinese style, arranging text from top to bottom makes it more attractive than others. Chinese is a semantic-based logography in which the structure-meaning relationship are much close than in English. On the other hand, English is phonologically based, so we can use its visual form as a cue for pronunciation but cannot derive a word's meaning merely from its structure. The second problem with generalising standards derived from one culture to a different culture comes from differences in socio-cultural norms and cognitive styles. Many aspects of psychological functioning, from aesthetics to interpersonal dynamics to motivations will vary from culture to culture. As a result, behaviors rules derived from one culture may not transfer to another. Choong and Salvendy (1999) found that for Chinese participants more than Americans, performance advantages were associated with concrete knowledge representation and with thematic interface structures.

5) During data collection, behavior mostly coincided with the cultural orientations as described in previous chapters. Comparing to Chinese users, British participants felt comfortable expressing their opinions about the Cards (web sites) and they felt confident in their capabilities to perform their tasks so quickly. Chinese users took longer time to do the test than British users.

In anthropological studies, English society is found to be universalistic, individualist, slightly masculine, with outer directed control, present time orientation, and activity focused on doing. The British participants' orientation, determined by their cultural background, is projected onto their perceptions of the web site.

7.4 Conclusions

Although there are not easily and clearly correlated with well-known international variables, the study of card sorting shows that the groups (British and Chinese)

generate different attributes in their sorts, indicating different concerns with web acceptance. There are also distinct differences in categorisation between groups. The methods thus far described have further potential for probing differential cross-cultural user perceptions of web-sites. Holistic studies of this type should ideally be followed by adaptations of card sorting that capture dynamic aspects (user's goals and navigation aspects) of sites as well as holistic (static) perceptions.

On the basis of the card sorting study, semiotic analysis study provides a supplemental analytical framework within which notions about the cultural and social context of web interface can be further approached. Semiotic analysis of web sites is able to reveal local cultural dynamics. Indeed, the very strength of semiotic analysis lies in its ability to relate specific site content to wider and often dynamically changing consumer behaviours and wider cultural phenomena.

Summary

This Chapter has:

- Proposed *card sorting* and *semiotics analysis* as methods to be tapped and deployed to identify semi-tacit knowledge in cross-cultural web acceptability;
- Described card storing study for specifying properties of a web page and quality measurement from users within specific regional / cultural backgrounds;
- Described the application of semiotic analysis of web sites to reveal local cultural dynamics.

Chapter 8

Corporate sites study: Cultural factor evaluation

Chapter objectives

This Chapter investigates the relevance of generic cultural characteristics to web site design. A comparison study is presented with Chinese and British users to determine the extent to which cultural factors do actually affect international acceptability.

8.1 Introduction

Although there is no lack of theoretical underpinning for cross-cultural acceptability, there is a lack of explicit demonstration that such theories are actually transferable to the field of cross-cultural acceptability. Theories such as Hofstede were formed some time ago, and whilst culture is generally agreed not to change too fast, the models were not developed with the intention of being applied to web sites. Additionally, there are views that being a global phenomenon Internet issues may apply globally, thereby transcending local concerns.

Hofstede's (1991) dimensions represent the theory most often quoted in relation to cross-cultural acceptability, probably because of the extensive quantitative data that Hofstede provides for many countries. However concerns remain about the transferability of Hofstede's work to world of the web and the extent to which web site developers should adopt these dimensions in their design activities.

In order to begin to investigate the relevance of generic cultural characters to web site design and to determine the extent to which cultural factors do actually affect international acceptability, a comparison study of cultural factors has been undertaken.

8.2 Study F: Quantify cultural factor from corporate sites

8.2.1 Aims of study F

Experimentation begins to validate Hofstede's cultural factors in the context of real web site users and usability. To undertake user studies, Taguchi method has again been used for experimental design and data analysis.

In the study reported here, the orthogonal array was again used to specify different types of web site factors, but in this case relating to three cultural factors (*power distance, individualism / collectivism*, and *uncertainty avoidance*), each existing at two levels. The target test sites for this study were all corporate sites.

Four corporate web sites, as shown in Table 8.1, were selected by several cross-cultural usability experts. The selection of the sites was based on Marcus and Gould 's web site design guidelines (shows in Table 8.2). The test sites were selected to fit the $L_4(2^3)$ orthogonal array.

Table 8.1: Orthogonal array factors levels and web sites selected

PD	IC	UA				SITE
1	1	1	High PD	Individual	High UA	WPP
1	2	2	High PD	Collectivist	Low UA	AD
2	1	2	Low PD	Individual	Low UA	ICI
2	2	1	Low PD	Collectivist	High UA	SG

Legend:
PD = Power Distance;
IC = Individualism/Collectivism
UA = Uncertain Avoidance
WPP = *WPP* (http://www.wpp.com)
AD = *Allied Domecq* (http://www.allieddomecqplc.com)
ICI = *ICI* (http://www.ici.com)
SG = *The Smiths Group* (http://www.smiths-group.com)

Table 8.2: Web design guidelines for specific Hofstede's cultural dimensions

Power distance	
High	**Low**
Structured information Emphasis on social moral order (nationalism, religion) Focus on expertise Prominence given to leaders Importance of certificates, awards and security	Wide band information No link with social moral order Focus on working together Prominence given to workers Importance of meeting individual needs
Individualism / collectivism	
Individualist	**Collectivist**
Focus on maximising personal achievement Materialism / consumerism demonstrate individual success Controversial / argumentative speech and extreme claims encouraged ('truth') Images of youth / activity rather than wisdom ('doing' not 'being')	Individual roles downplayed (product shown on its own), focus on group Personal goals often intrinsic Preference for socially supportive claims – discourage controversy ('relationships' not 'truth') Respect for tradition (historical focus)
Masculinity / femininity	
Masculinity	**Femininity**
Traditional gender / family / age distinctions emphasised Work roles / tasks emphasised Mastery most important – web sites designed for exploration and control Games / competitions grab attention Artwork may be utilitarian	Gender work roles blurred Mutual support more important than mastery – web sites task oriented and provide quick results for limited effort Poetry / unifying values may focus attention Neutral images, traditional art, soft focus
Uncertainly avoidance	
High	**Low**
Keep it simple Results / implications of actions need to be revealed Avoid being lost in hyper-space Reduce user error – provide task based help Carefully encode meaning of actions: e.g. use of colour	Complexity and risk valued – no need to protect users form failure Less effort to control navigation Help focuses on information rather than tasks Encoding of meaning less important – flexible use of colour and other cues

All sites (as shown in Figure 8.1) used English as their default language. Following this study further work will include the investigation of indigenous Chinese sites with Chinese users. (See chapter 9 for detail).

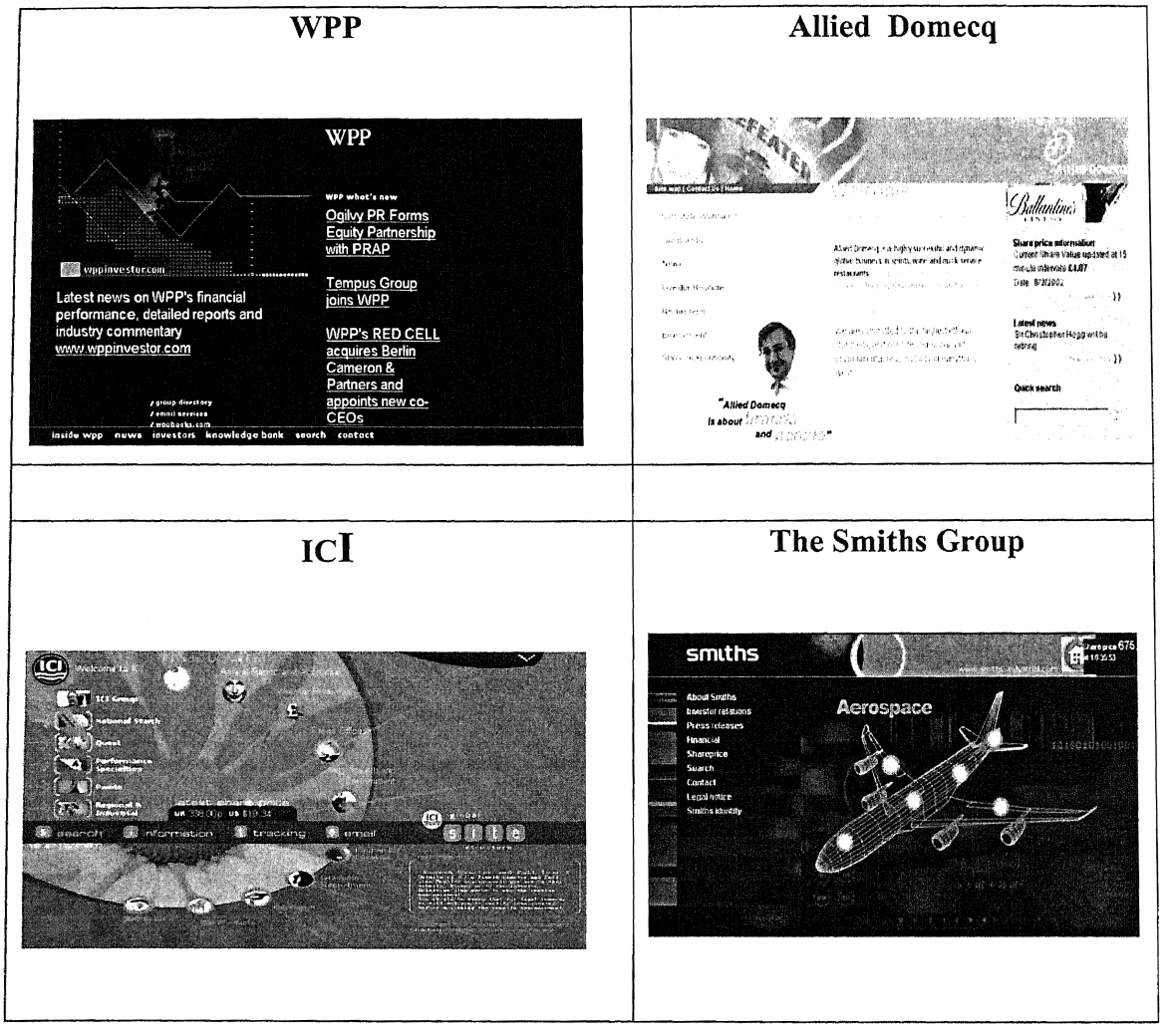


Figure 8. 1: Corporate test sites

8.2.2 Study F: methodology

During the test, users were asked to complete the following tasks during their navigation of the assigned sites:

- Access the latest profit and loss accounts
- Read the Chairman's latest statement
- Find out which areas the company sees to be those for future growth – i.e. strategic direction
- What markets are the shares traded in?
- Does the company have an environmental policy?

Chinese users were mainly post-graduate students and staff of the University of Luton who had been previously educated in China. British users are students and staff from University of Luton. After navigating these sites, a usability satisfaction questionnaire was then completed by each test subject. The results from the usability satisfaction questionnaires formed the basis for the quality characteristics used in the Taguchi analysis.

8.2.3 Study F: Data analysis, results

Table 8.3 presents the Taguchi analysis for Chinese users. The 'Optimum' sections show the preferred type of web site for each user group (as listed in the 'opt level' column), together with the contribution which each of the factors made to the expected result (i.e. predicted satisfaction level), the 'ANOVA' section provides the percentage contribution that each of the web site factors made together with the F ratios.

Table 8. 3: Results and analysis (Chinese users)

OA				RAW DATA (CHINESE)					SITE
1	1	1	1	94	48	46	42	34	WPP
2	1	2	2	56	68	64	62	68	AD
3	2	1	2	46	24	60	54	60	ICI
4	2	2	1	70	78	96	74	78	SG

Optimum

FACTOR	OPT. LEVEL DESCRIPTION	OPT LEVEL	CONTRIBUTION
PD	Low PD	2	5.9
IC	Collect.	2	7.299
UA	High UA	1	1.9
Total contribution from all factors			15.099
Current grand average of performance			64.099
Expected optimum results			79.198

ANOVA

Fcrit 1,16(0.10) =3.048 Fcrit 1,16(0.05) = 4.494 , Fcrit 1,16(0.025) = 6.1151

FACT.	DF	SUM OF SQUARES (S)	VARIANCE (V)	F RATIO	PURE SUM (S')	PERCENT (%)
PD	1	696.2	696.2	3.148	475.1	8.44
IC	1	1065.7	1065.7	4.820	844.7	15.72
UA	1	72.2	72.2	0.362	0	0
Other	16	3537.6	3537.6	------	------	75.43
Total	19	5371.8	---------	------	------	100

Chinese users preferred a *low power distance, collectivist*, and *high uncertainty* web site. Power distance ($p<0.10$) and collectivism ($p<0.05$) were both significant. These two factors account for 24% of variability, showing that they were important in effecting user preferences.

The result indicates that *uncertainty avoidance* is not significant important to Chinese web users, implying that other issues unrelated to these three cultural factors (eg. Confucianism or Long term orientation) might be more important for Chinese users. Table 8.4 presents the Taguchi analysis for British users:

Table 8.4: Results and analysis (British users)

Raw Data (British)

OA				RAW DATA (BRITISH)					SITE
1	1	1	1	44	64	24	42	32	WPP
2	1	2	2	68	84	76	72	76	AD
3	2	1	2	76	86	74	72	88	ICI
4	2	2	1	80	90	92	82	82	SG

Optimum

FACTOR	OPT. LEVEL DESCRIPTION	OPT LEVEL	CONTRIBUTION
PD	Low PD	2	11.999
IC	Collect.	2	9.999
UA	Low UA	2	6.999
Total contribution from all factors			28.996
Current grand average of performance			70.199
Expected results at optimum condition			99.196

ANOVA

Fcrit 1,16(0.05) = 4.494 ,Fcrit 1,16(0.01) = 8.5310, Fcrit.1,16 (0.005)=10.575

FACTOR	DF	SUM OF SQUARES (S)	VARIANCE (V)	F RATIO	PURE SUM (S')	PERCENT (%)
PD	1	2879.997	2879.997	33.41	2793.796	38.592
IC	1	1999.997	1999.997	23.201	1913.796	26.436
UA	1	979.997	979.997	11.368	893.796	12.346
Other	16	1619.75	134.979	---------	---------	22.626
Total	19	4433.94	---------	---------	---------	100

British user group was found to prefer low *power distance, collectivism,* and low *uncertainty avoidance* web site. *Power distance*, *collectivism* and *uncertainty avoidance* are however significant and important, the three factors account for 77.4% of variability as shown in Figure 8.2, which is a high (i.e. good) value for experiments of this type showing that they were important in effecting user preferences.

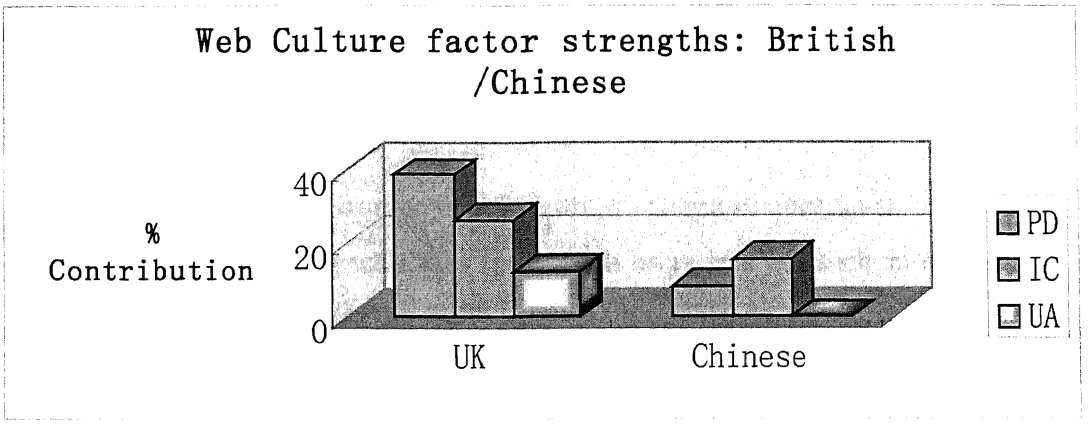


Figure 8. 2: Results comparison

Comparing with the two users groups, these results need to be interpreted in the context of Hofstede's and others' analysis of cultural factors for Chinese users. Two issues are of note:

1. Chinese users might be expected to prefer sites that demonstrate *collectivist* characteristics, and the results support this proposition.

2. In contrast, China is also considered to be a relatively high *power distance* culture, but the results indicate that Chinese users prefer web sites that have low *power distance* characteristics.

8.2.4 Study F: discussion and conclusions

The question to be answered here is the extent to which generic cultural issues effect web site usability and acceptability. The results for this user group support collectivism as a generic factor (same generic level and high percentage contribution) but not power distance. Perhaps global issues are at play here in which the web is seen as a way of breaking down barriers of communication. If this were a significant issue then all cultures might prefer low levels of power

distance regardless of level of power distance within the indigenous culture.

In relation to theoretical cultural factors (such as Hofstede's cultural dimensions), the study has indicated that generic models of culture may not be easily transferable to the Web environment. For example although uncertainty avoidance is a key issue for designing web sites for British users it is not such an important issue for Chinese Web users. In addition generic expectations of power distance do not seem to necessarily apply to the web environment.

It must be noted that, in this study, the test sites were English, not Chinese language sites for Chinese users. Therefore, potential side effects may exist. Local language sites with local user test should be carried on, to get rid of the side effect for Chinese users. It is also necessary to make large-scale user based *in situ* studies to verify and identify fundamental and generalisable cultural differences between Chinese and British users.

Summary

This Chapter began to investigate the relevance of generic cultural characteristics to web site design:

- A comparison study was conducted with Chinese and British users to determine the extent to which cultural factors do actually affect international acceptability;
- In relation to theoretical cultural factors (such as Hofstede's cultural dimensions), the study has indicated that generic models of culture may not be easily transferable to the web environment;
- Results indicated that uncertainty avoidance is a key issue for designing web sites for British users it is not such an important issue for Chinese web users.

Chapter 9

Quantifying cultural characteristics and developing cultural fingerprint

Chapter objectives

This Chapter presents detailed and exploring in situ study of cultural factors. It attempts to describe the evolution of the concept of the 'cultural fingerprint' and the construction of two versions of cultural fingerprints. Applications of the cultural fingerprint will also been discussed.

9.1 Culture and commercial practice

One of goals of the thesis is to quantify the importance of generic cultural factors (e.g. Hofstede). As a result of Taguchi experimental design studies, the possibility of presenting the percentage contribution of factors in a diagrammatic form has emerged. A diagrammatic representation of the significant characteristics of culture can be compared with associated fingerprints for web sites acceptability. In pursuing this line of research it has been possible to propose the concept of a 'cultural fingerprint' to facilitate the comparison of web site characteristics with cultural requirements. In fact, the first step of implementing such a concept in the commercial environment has successfully been carried out by optimum.web limited in the UK (www.optimum-web.co.uk) during their commercial practice.

9.2 'First-shot' cultural fingerprint produced by optimum.web limited

A key issue that has emerged from international usability projects at optimum.web limited is the need to provide an accessible means through which the cultural characteristics of a particular web site can be discussed with clients. In response to this need they started developing the concept of a 'cultural fingerprint' which can diagrammatically compare the cultural profile of a web site (Site Fingerprint) with that of its target cultures (Country or Culture Fingerprint). The characteristic of this 'first-shot' cultural fingerprint is that it addresses four of Hofstede's dimensions and presents Hofstede's data on a scale from 0 to 10.

9.2.1 Country fingerprints

Taking *power distance* (PD), for example, Hofstede lists PD scores for 53 countries from a score of 11 for Austria (low PD), to 104 for Malaysia (high PD), with the UK scoring 35. On the 10 point scale, UK scores 10x(35-11)/(104–11)=3.76. The score for PD along with equivalent scores for IC, MF and UA lead to the specification of the 'first-shot' country / cultural fingerprint, adopting a 'radar diagram' approach, is shown in Figure 9.1.

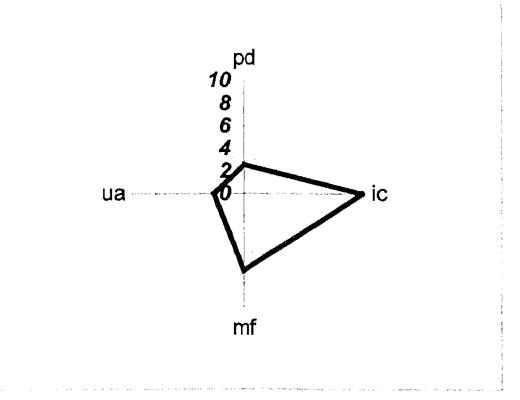


Figure 9.1: 'first-shot' country fingerprint for UK

It is refereed here as a 'first-shot' fingerprint as the diagram suggests that each of

the four dimensions are equally important, and indeed that they are actually significant at all. In the latter sections of this chapter, a revised version of the fingerprint will be shown. The chapter will how the concept has been developed to take account of the actual significance of Hofstede's cultural dimensions within specific countries / cultures.

9.2.2 Site fingerprints

At optimum.web, site fingerprints are developed from expert evaluation. In this case up to five independent experts rate each of the four dimensions on a scale of 0 to 10, and the average value is used to determine the site fingerprint. At optimum.web the consultants are experts in cross-cultural usability. They assess sites against criteria based upon Marcus and Gould's (2000) guidelines (referring to Table 8.1 in Chapter 8 for detail). By comparing country and site fingerprint the usability / acceptability of web sites can be diagrammatically (and potentially numerically) matched to the target culture. The approach has been applied by optimum-web limited to a number of high profile international clients in the e-finance and e-commerce sectors.

In the UK, the Financial Times's Shareholder Communications survey (16/11/01) ranked the web sites of all 300 constituent members of the FTSE Eurotop 300 Index under two categories of technology / functionality and content. The result was claimed to be the most thorough assessment yet of company web sites from the point of view of the international investor. However one issue that was not addressed was the usability of each site to a global audience of potential investors. In order to explore the suitability of these sites to a global audience optimum.web identified a sub-set of site roughly equally spread out over the FT's listing. Through expert evaluation the site fingerprint of each site was generated. Four cultures in which UK companies seek significant shareholder investment are the USA, Germany, Japan and Arab countries. Therefore, in order to investigate the suitability of the sites to the target global audience, the cultural fingerprints of these countries was then also generated. Figure 9.2 presents the site fingerprint of

two of these sites together with cultural fingerprints of two key investor countries: USA and Japan.

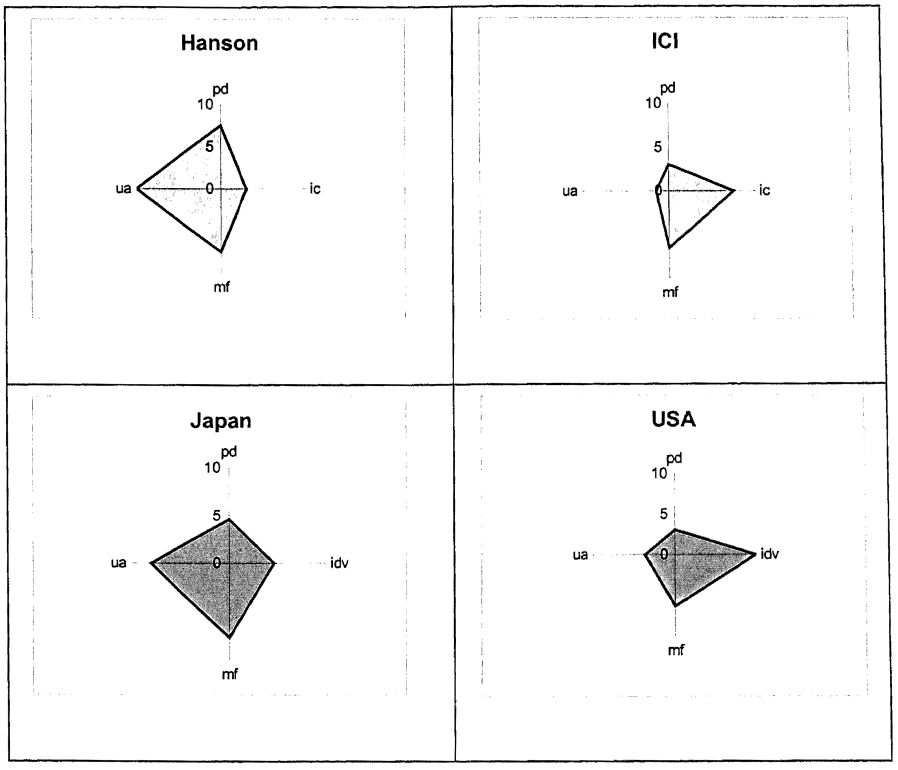


Figure 9.2: Site fingerprints examples for Corporate investor web sites (Smith and Chang, 2003)

From comparison of site fingerprint with cultural fingerprints, some very interesting differences emerged. The Hanson site (www.hansonplc.com) was the best of the five sites in the FT survey, but its site fingerprint would not seem to match many of the target cultures. However it could be an effective mode of communication with people in Japan. The ICI site (www.ici.com) is almost a mirror image of that of Hanson and is quite suitable for a US audience. The question here is: are these two companies really aiming their communications to totally different client and cultural groups? In Figure 9.2, by comparing the web site fingerprint with separate fingerprints for each culture, localisation could be effectively evaluated.

Optimum.web also claim that it is possible to develop a weighted average fingerprint for all the target cultures, based upon known or desired usage profile,

and thereby to evaluate globalisation in order to determine whether a 'cultureless' standard (Day, 1996) has been achieved.

This thesis will return to this 'corporate site study' later in this chapter.

9.3 Study G- Enhanced cultural fingerprint

As shown in previous sections, 'first-shot' fingerprints are based on generic expectations of cultural factors using data reported by Hofstede, rather than specific web based experimental data. The work, as reported in this chapter, will show that there are indeed significant differences in the importance of such factors. Based on user study and data collection in Chapter 8, cultural factors could be quantified for various cultural groups and it also make possible to develop the enhanced version of cultural fingerprint to take account of these.

In order to take account of actual significance of cultural dimensions, an enhanced fingerprint have been proposed which uses 'circle sectors', as opposed to radar diagrams as the mode of representation. The one-dimensional 'first shot' fingerprint (Figure 9.1 and Figure 9.2) only addressed the magnitude of each issue (e.g. 2.58 for UK power distance), whereas the two-dimensional 'enhanced' fingerprint can address both magnitude and importance.

Figure 9.3 shows an enhanced version of cultural fingerprint. By comparing user and site fingerprint the usability and acceptability of web sites can be both diagrammatically and numerically matched to the target culture.

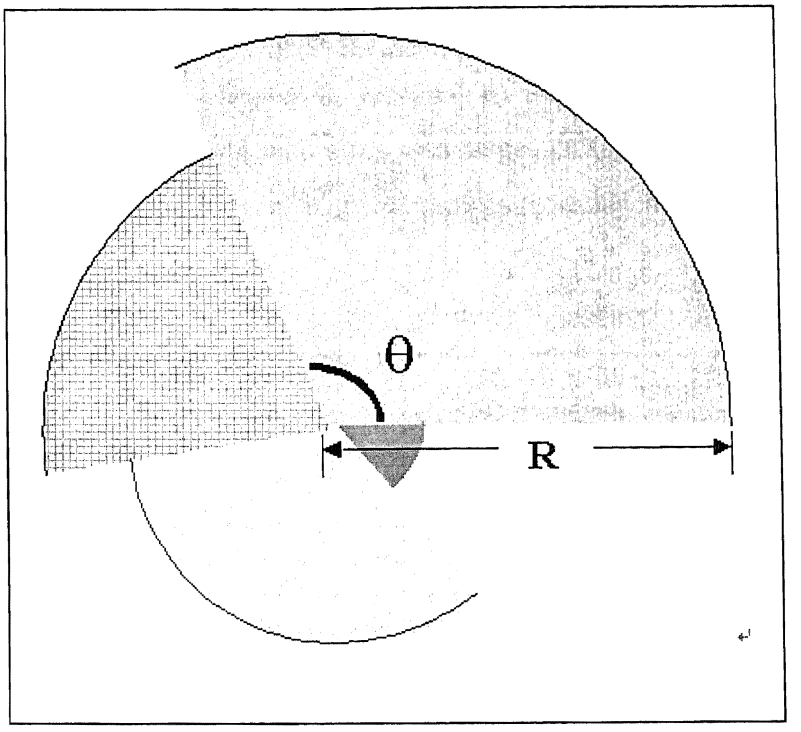


Figure 9. 3: Structure and features of a fingerprint

The features of cultural fingerprint could be summarised as follows:

- reflects real significance of cultural differences by real users
- cultural identity of specific web site
- highly visual impression, easy to remember
- maintains accessibility of concepts with commercial clients

There are two basic elements to construct a cultural fingerprint:

In the enhanced fingerprint the sector angle (θ), represents the importance of the factor within the culture / country. The sector angle will be the same for both site and culture fingerprint. The radius of the sector (R) is determined by the magnitude the factor in the culture – either from Hofstede scores for the country fingerprint or by expert evaluation for the site fingerprint.

9.3.1 Enhanced Culture fingerprint

To date research based on Hofstede's cultural dimensions and results from the corporate sites study in Chapter 8, has led to the development of a first-shot 'cultural fingerprint' for both web sites and target cultures in the UK and China. Hofstede's has given the sores of cultural factors from his study in Table 9.1:

Table 9.1: Scores of Hofstede 's cultural factors

	Power Distance Score (country)	**Individualism / Collectivism Score (country)**	**Uncertainty Avoidance Score (country)**
Lowest Score	11(Austria)	6 (Guatemala)	8 (Singapore)
UK	35	89	35
China	80	15	36
Highest Score	104(Malaysia)	91(USA)	112(Greece)
Range	93	85	104

In order, for example to obtain the radius for British users in respect of the *power Distance* dimension, we need to:

Calculate the range

Range = highest score – lowest score,

So, the range for *power distance* is 104-11=93;

Normalise the value of radius between 0 to 10.

So, for British

$$Radius = \frac{35-11}{93} \times 10 = 2.58$$

As a result, all the values of fingerprint radius for UK and China are listed in Table 9.2.

Table 9.2: Radius of fingerprint

	Power Distance Radius	Individualism / Collectivism Radius	Uncertainty Avoidance Radius
UK	2.6	9.7	2.6
China	7.4	1.1	2.7

As a first attempt at deriving cultural fingerprints the data from the previous chapter may be used. It is accepted that being based in the UK the results may not be fully reliable. However later in this chapter detailed studies from within China will be reported. In effect this section 'sets the scene' for cultural fingerprints. Cultural factor contribution results from corporate site study in Chapter 8 can therefore provide the basis for calculating of the fingerprint sector angle (θ).
Sector angle for British, for example, in *power distance* dimension is obtained as following:

$$\theta = \frac{Contribution(PD)}{Contributon(sum)} \times 360 = \frac{38.592}{77.347} \times 360 = 179.6$$

Table 9.3 and Table 9.4 show all the values of sector angle for both British and Chinese respectively.

Table 9.3: Sector angle for British

Factor	% of contribution	Contribution / total (%)	Sector angle
Power distance	38.592	49.89	179.604
Individualism / Collectivism	26.436	34.19	123.084
Uncertainty avoidance	12.346	15.96	57.456
Sum	77.347	-------	---------

Table 9.4: Sector angle for Chinese

Factor	% of contribution	Contribution / total (%)	Sector angle
Power distance	8.844	35.98	129.528
Individualism / Collectivism	15.724	63.98	230.328
Uncertainty avoidance	0.01	0.001	0.144
Sum	24.578	-----	-------

Base on values of radius and sector angles, as presented in Figure 9.4, two primary enhanced cultural fingerprints have been constructed for UK and China.

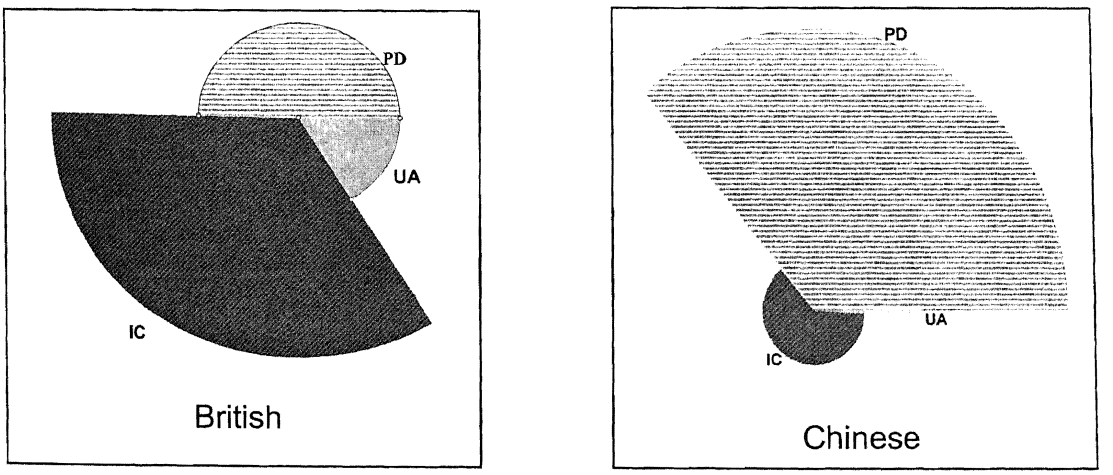


Figure 9.4: Country/cultural fingerprints for British and Chinese

9.3.2 Enhanced Site fingerprint

A further example is now provided to illustrate the concept with the corporate study from Section 9.5. Three cross-cultural web usability experts gave their evaluation scores of the ICI web site (http://www.ici.co.uk), according to three cultural dimensions (*power distance*, *individualism/collectivism*, and *uncertainty avoidance*). By using the average values of the experts' evaluation, it is possible to constitute the enhanced site fingerprint for the test site ICI. Therefore, as

shown in Figure 9.5, a comparison study of the enhanced site fingerprint with two enhanced cultural fingerprints (UK and China) can now be carried out.

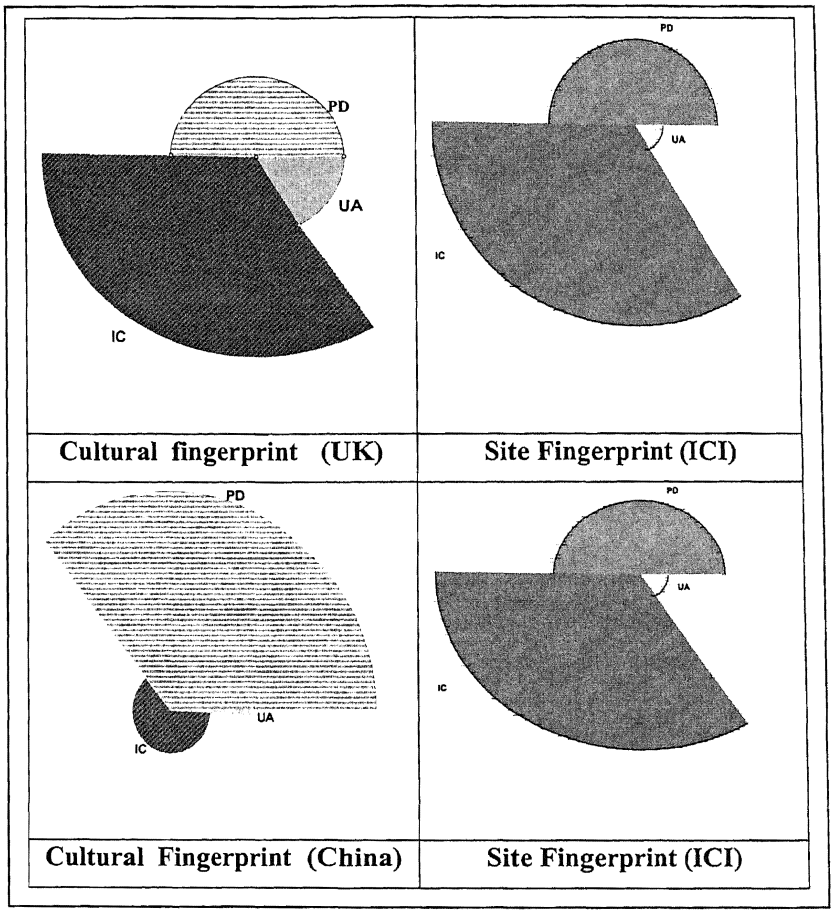


Figure 9.5: Enhanced fingerprints comparison

Analysis shows that, the ICI site fingerprint is similar to UK's cultural fingerprint, but not is similar to China's cultural fingerprint. Therefore, the suitable target users of ICI site will be British users. If the target users are Chinese, the real site should be modified in power distance and individualism /collectivism dimensions as to fit the Chinese Culture.

9.4 Case studies: Hofstede in China

As mentioned before, the test sites in the corporate study used English, not Chinese language for Chinese users testing, therefore potential side effects may

exist. In order to verify the applicability of cultural dimensions to web site acceptability, local language (Chinese) sites with local user (Chinese users) tests should be carried on to eliminate the side effect in the context of Chinese culture.

Two case studies in China (Beijing, Dalian and Kunming) have been completed in which Chinese users were asked to undertake a series of tasks on at most two Chinese web sites. Two set of the sites were chosen as they possessed different levels of the factors of *power distance, individualism / collectivism, masculinity / femininity* and *uncertainty avoidance*. These factors were mapped to 2 independent $L_4(2^3)$ orthogonal arrays in order to construct revised version of Chinese cultural fingerprint.

After accessing the sites users were then asked to complete a relatively simple quantitative survey instrument designed to elicit their overall 'acceptance' of the site. A number of issues were considered within the overall acceptance such as: appropriateness of layout and navigation, ease of information access, level of trust engendered and likeliness of return and recommendation to others.

9.4.1 First study

The first study investigated the relative significance of power distance, individualism and uncertainly avoidance. Four web sites (Figure 9.6) were selected with high and low characteristics for the three dimensions to fit the orthogonal array as shown in Table 9.5:

Table 9.5: Orthogonal array: factors levers and web sites selected (First study)

ORTHOGONAL ARRAY						
PD	**IC**	**UA**	**PD**	**IC**	**UA**	**Site**
1	1	1	High	Individual	High	www.yanjing.com.cn
1	2	2	High	Collectivist	Low	www.lolo.com.cn
2	1	2	Low	Individual	Low	www.wahaha.com.cn
2	2	1	Low	Collectivist	High	www.loulan.com.cn

Legend:
PD = Power Distance;
IC = Individualism/Collectivism
UA = Uncertain Avoidance

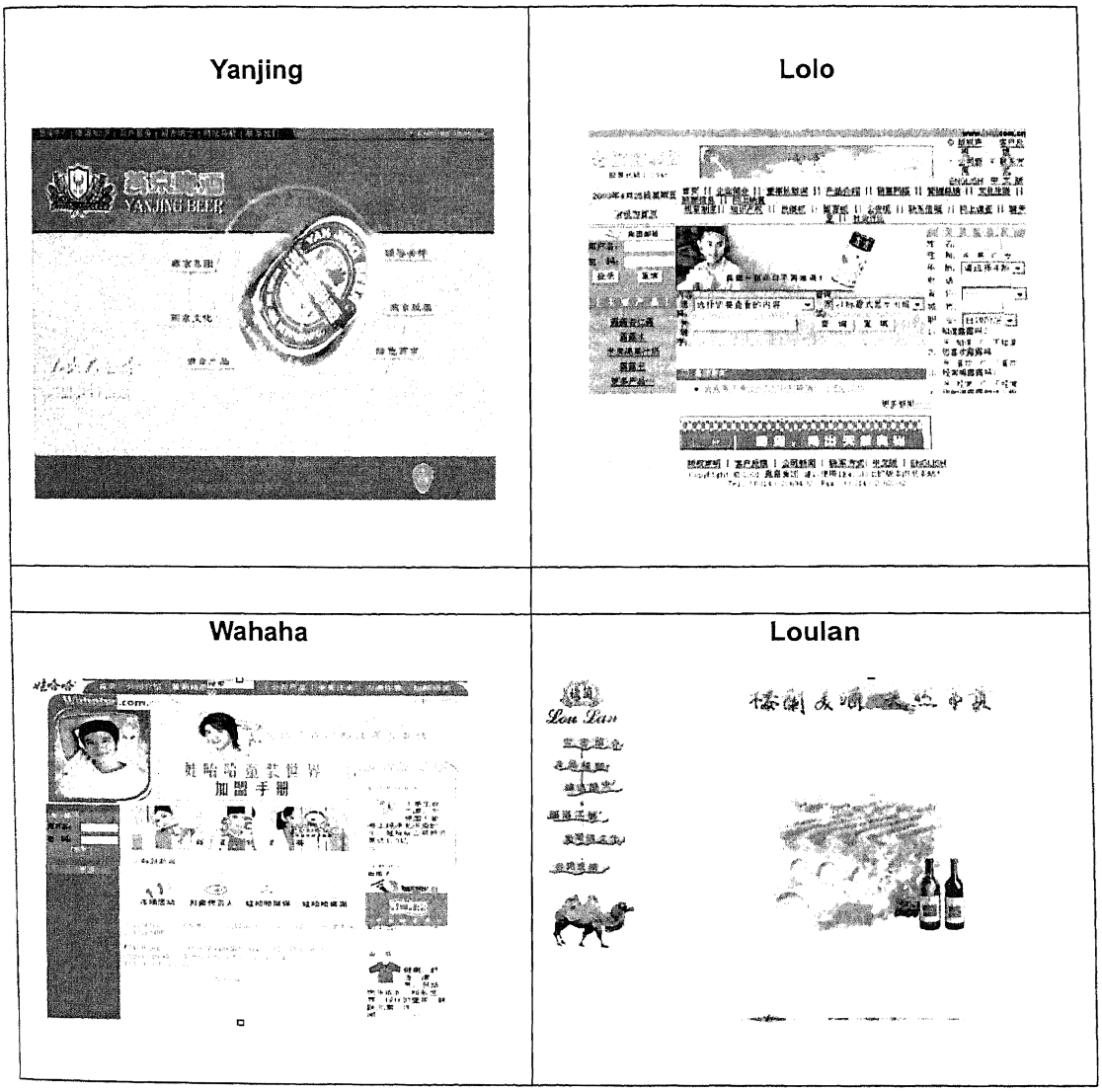


Figure 9.6: Test sites for first study

In Table 9.6 we present the Taguchi analysis. The 'Optimum' section show the preferred type of web site together with the contribution which each of the Hofstede dimensions made to the expected result. The 'ANOVA' section provides the percentage contribution that each of the web site factors made together with the F ratios. The three percentages shown in the final column represent the relative importance / significance of these three cultural issues to acceptability in

the Chinese context.

Table 9.6: Data analysis (First study)

Optimum

Dimension	Preferred level for dimension		Contribution
PD	High PD	1	3.32
IC	Individualistic	1	0.92
UA	High UA	1	0.57
Total contribution from all factors			4.72
Current grand average of performance			27.38
Expected optimum results			32.10

ANOVA

Fcrit 1,36 (0.05) = 4.11, Fcrit 1,36 (0.10) = 2.85

Dim.	DF	Sum of squares (S)	Variance (V)	F Ratio	Pure Sum (S')	Percent (%)
PD	1	416.0	416.0	22.70	397.7	35.4
IC	1	34.2	34.2	1.87	15.9	1.4
UA	1	13.2	13.2	0.72	0.1	0.01
Other	36	659.9	18.33	------	------	63.19
Total	39	1123.4	---------	------	------	100

Before discussing the results for the individual factors / dimensions it is worth looking at the significance of the error term in ANOVA. At 63.2% this might initially seem high, but this value accounts for all other variability within the study – other web site factors, and user variability. From the author's experience this is quite a normal value. In fact, it is quite significant that the three factors under study account for 36.8% of variability, showing that these issues are important.

A number of findings emerge from Study A. Firstly by far the most significant / important dimension is that of power distance, with 35.4% of the variability in the experiment being a result of differences in PD. The preferred level was, as predicted by generic cultural models, that of High PD. In relation to IC, Chinese users were found to marginally prefer individualistic sites, in contrast to possible expectations. Hofstede only suggested UA to be relevant to Western cultures and this is vindicated in the fact that this factor was not found to be significant at all for Chinese users.

9.4.2 Second study

Another study investigated the dimensions of *power distance, individualism / collectivism* and *masculinity / femininity*. Again four (different) web sites (Figure 9.7) were selected with high and low characteristics for the three dimensions to fit the orthogonal array as shown in Table 9.7.

Table 9.7: Orthogonal array: factors levels and web sites selected (Second study)

Orthogonal array						
PD	**IC**	**MF**	**PD**	**IC**	**MF**	**Site**
1	1	1	High	Individual	Masculine	www.cnooc.com.cn
1	2	2	High	Collectivist	Feminine	www.c-bons.com.cn
2	1	2	Low	Individual	Feminine	www.healthcn.com
2	2	1	Low	Collectivist	Masculine	www.57777.com

Legend:
PD = Power Distance;
IC = Individualism/Collectivism
MF = Masculine/Feminine

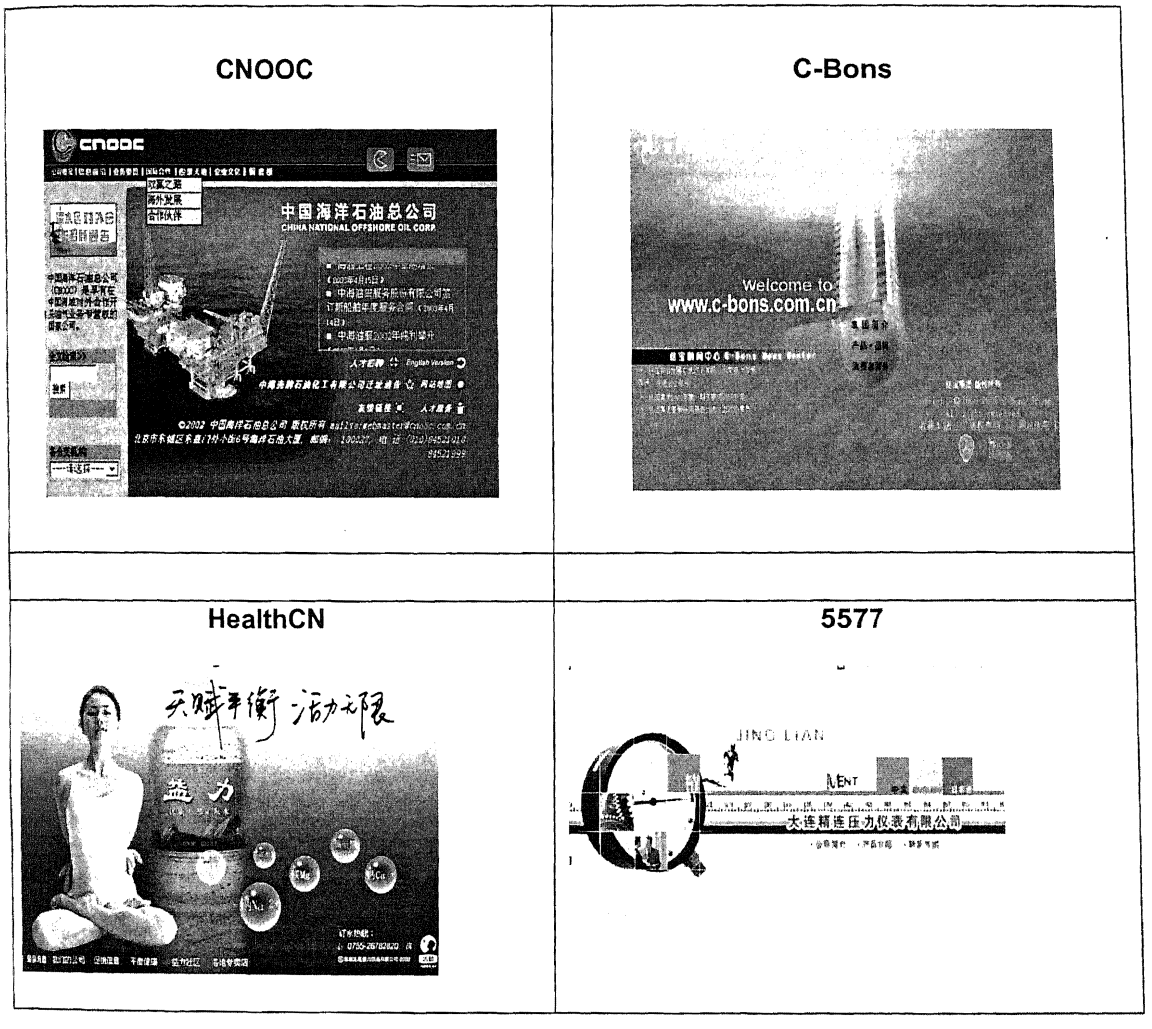


Figure 9.7: Test sites for second study

Table 9.8 presents the Taguchi analysis and again the three percentages shown in the final column represent the relative importance / significance of these three cultural issues to acceptability in the Chinese context. As in Study A, *power distance* was found to be the most significant dimension with *individualism / collectivism* much less so. The preferred levels confirmed the results of Study A. In addition Chinese users were found to prefer masculine sites, an interesting result as there is little current evidence in this area.

Table 9.8: Data analysis (Second study)

Optimum

Dimension	Preferred level for dimension		Contribution
PD	High PD	1	2.425
IC	Individualistic	1	1.175
MF	Masculine	1	1.675
	Total contribution from all factors		5.274
	Current grand average of performance		26.825
	Expected optimum results		32.1

ANOVA

Fcrit 1,36 (0.05) = 4.11, Fcrit 1,36 (0.10) = 2.85

Dim.	DF	Sum of squares (S)	Variance (V)	F Ratio	Pure Sum (S')	Percent (%)
PD	1	235.2	235.2	13.0	217.2	20.6
IC	1	55.2	55.2	3.1	37.2	3.6
MF	1	112.2	112.2	6.2	94.2	9.0
Other	36	649.1	18.03	------	------	66.8
Total	39	1051.8	---------	------	------	100

9.4.3 Comparing the two studies and constructing the cultural fingerprint for Chinese users

There were encouraging similarities between the percentage contributions for the four Hofstede factors over the two studies. Summary data from the AVOVA is presented in columns 1 to 3 in Table 9.9. In addition, in column 4, the contributions from Study A are scaled to equate to those from Study B. The values for PD (23.3% and 20.6%) and for IC (0.92% and 3.6%) presented are indeed remarkably close. Column 5 presents the combined average for each of the factors over the two studies.

Table 9.9: Summary data and sector angles for fingerprints

	First study	Second study	Second study (Scaled)	Average: first study and second study (scaled)	Sector angle
PD	35.4	20.6	23.3	21.95	237.9
IC	1.4	3.6	0.92	2.26	24.5
UA	0.01	- - - -	0.01	0.01	0.1
MF	- - - -	9.0		9.00	97.5
Total	36.8	33.2		33.22	360

From data such as that collected in these China studies it is now possible to construct more reliable enhanced fingerprints. The final column of Table 9.9 (Sector angle) is derived from the combined significance (percentage contribution) of each factor in both Study A and B. For power distance, the sector angle is calculated from 21.95 / 33.22 x 360 = 237.9°. The sector angles will be the same for both site and country fingerprints.

The radius of the sectors for the country fingerprint is obtained from the best available score for that factor / dimension in the target culture / country. In relation to the latter is should be noted that Hofstede's initial work, being based on IBM employees did not include China. The results here include a mix of more recent scores for China and a weighted average of scores for Hong Kong, Taiwan and Singapore. The equivalent Hofstede scores adopted were therefore PD=80 (7.4 on scale 1-10), IC=15 (1.1), UA=35 (2.6), MF=50 (5.0). As a result Figure 9.8 presents the latest version of the revised cultural fingerprint for China:

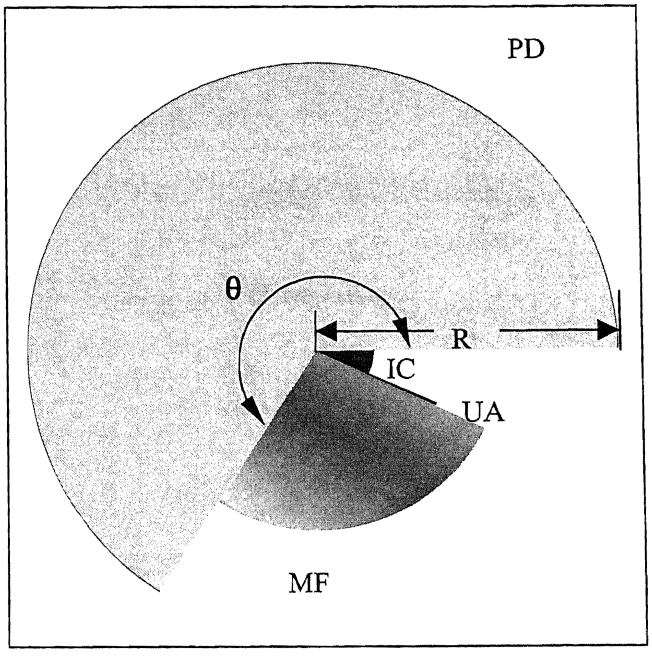


Figure 9.8: Enhanced cultural fingerprint for Chinese users

9. 5 Application of cultural fingerprints

Real site fingerprints and target cultural fingerprints have a potentially useful application in helping web designers to verify and localise their web site for the target country / culture through the following steps and as shown in Figure 9.9:

1. Construct site fingerprints from at least three experts in cultural factor evaluation based cross-cultural web usability guidelines such as proposed by Marcus;

2. Compare the site fingerprint with the target culture fingerprint, and identify the differences according to each cultural dimension;

3. Revisit the guidelines to modify the site in order to fit the target culture requirements;

4. Repeat 1-3, until finally get a suitable site fingerprint for that target culture.

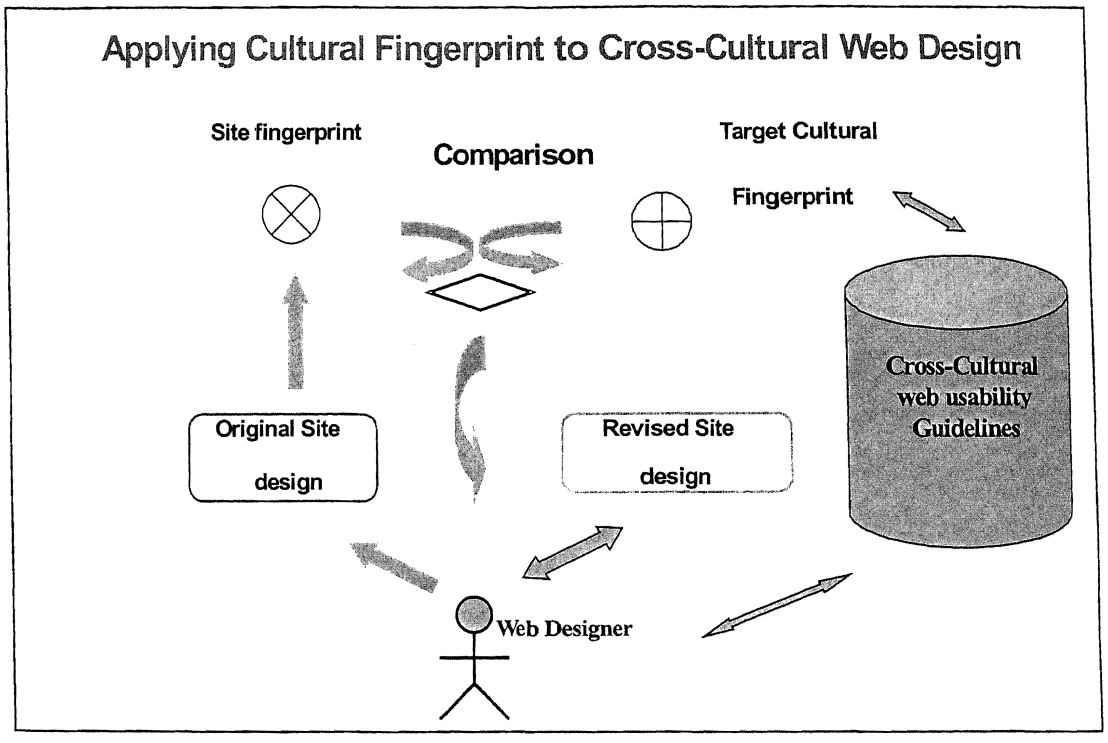


Figure 9.9: Applying culture fingerprint for web design

The next stages in this area of research are as follows. Firstly to undertake further empirical studies in other countries / cultures and to investigate factors proposed by researchers other than Hofstede. Secondly, based upon the cultural fingerprints (and underlying quantitative data) to develop specific localised design guidelines. In effect the research reported here informs which of the generic guidelines (Marcus and Gould, 2000) actually need to be addressed in order to optimise international web site acceptability.

Summary

This Chapter has:

- Proposed cultural fingerprints as a diagrammatic means of representing and communicating culture in the context of web site acceptability;
- Described the evolution of the concept of the 'cultural fingerprint' and how about two versions of cultural fingerprints are constructed;
- Constructed a proposed/revised fingerprint for Chinese users by first hand field study carried out in China. From empirical research conducted in China it also been concluded that considerable caution needs to be adopted when applying generic models of culture to the world of the web;
- Described the practical applications of the cultural fingerprint.

Chapter 10

Conclusions and further work

Chapter objectives

This Chapter overviews the main aims and concludes the objectives of this thesis. The research contribution to the knowledge and further work necessary within the field are also discussed.

10.1 Overview

The eCulture research project, which has underpinned this thesis, is rooted in previous classical theories and research in cultural differences. Within the field of cross-cultural acceptability it has applied quantitative factorial experimental design experiments (based upon Taguchi methods) together with other qualitative approaches such as semiotic analysis and card sorting.

The overall aim of the study has been to research and specify the specific cultural needs of Chinese and British web site users, with the ultimate goal of providing global web site owners and developers with further guidance on how to build successful web sites within the Chinese context.

In particular it has sought to address the following three key objectives:

1. To ascertain the extent to which there are genuine differences in acceptability requirements between UK and Chinese web users.
2. To explore, categorise and measure the characteristics of such differences.
3. To relate such differences to the web site design process so as to provide guidance to web site developers in order to build usable sites in the Chinese

context.

Two key approaches to study - both 'top-down' approaches and 'bottom-up' approaches - have been implemented to investigate differences in web site usability and acceptability between users from Mainland China and the United Kingdom.

One of the key goals that emerged within the project (and one of the key contributions to knowledge within this thesis) is the concept of the 'cultural fingerprint', which can be specified for both web sites and users in different cultures. By comparing cultural and site fingerprints, usability and acceptability of web sites could be matched to the target culture. Experimentation investigation of qualitative factors together with quantitative data collection and analysis based on the Taguchi method has led to the successful development of two version of the 'cultural fingerprint' for both web sites and target cultures in the UK and China.

10.2 Objective 1: are there real differences in web site acceptability?

The first key objective was as follows:
To ascertain the extent to which there are genuine differences in acceptability requirements between UK and Chinese web users.

Three years of research to date has proved that there are indeed differences in acceptability requirements between UK and Chinese users. The following substantiates this claim.

Results from Study D (the card sorting study) has shown that:

- The number of criteria generated by the two groups was shown to be significantly ($p < 0.10$) different. British users constructed more criteria than Chinese users.

- In relation to the number of super-ordinate respondents constructed, British users generated more sub categories in their super-ordinate categories.
- The majority of British users regarded *usability* as a very important issue when they construed the category, but Chinese users rarely mentioned issues relating to usability.
- Within the hierarchy comparison, Chinese users constructed more categories relating to *art design* and *colour*, whereas British users constructed more concerning *navigation* and *contents*.
- Within the feature comparison, British users' preferred site was *formal*, *vivid* and *attractive*, consisting of *clear information*. It also to be *easy to use* and should engender *trust*. Chinese users, however, regarded *traditional (oriental) style*, *concise design* and *clear of information* as their preferred options. It also needed to *look attractive and exciting* for its high use of *red colour*.

Furthermore, results from Study C (Pilot e-Finance Study) also indicate that:

- Although both British and Chinese young male expert users indicated a preference for *detailed information*, within a *user focused* and *graphical environment* there were statistically significant differences in importance.
- Although both UK and Chinese user groups indicate that a detailed user focus represents a 28% contribution to their assessment of the sites, in the case of detailed information the contribution for Chinese users (11%) is well under half that of UK users (28%).

Therefore, in summary, research to date has proved that there are indeed differences in acceptability requirements between UK and Chinese users.

10.3 Objective 2: How are these differences evident?

Having established that key differences truly exist, the second key objective was as follows:

To explore, categorise and measure the characteristics of such differences.

The second stage of this research was to explore, categorise and measure the characteristics of such differences.

Results from Study G (Cultural fingerprint experiments) and Study F (Corporate sites study) show that:

- Chinese users were found to prefer *high power distance*, *individualism* and *masculine sites*. *Power distance* was found to be the most significant dimension with *individualism / collectivism* much less so. *Uncertain avoidance* is proved not to be an important issue for Chinese users.
- Contrasting this with British Users, the British user group was found to prefer *low power distance, collectivism*, and *low uncertainty avoidance* web sites. *Power distance, collectivism* and *uncertainty avoidance* are however significant and important, the three factors account for 77.4% of variability which is a high value for experiments of this type showing that they were important in effecting user preferences.

Furthermore, results from Study B (General web usability and Internet development investigation), also evidenced that:

- In relation to Internet development investigation, British users gave very positive attitudes for the Internet development in the UK. Whereas, Chinese users gave negative attitudes.
- In relate to web usability investigation, there are also differences exist between users in UK and China.

With the evidences for the differences, the author extract the possible categories / characteristics of differences as follows:

Cultural differences

This thesis reports experiments to investigate generic cultural models such as that proposed by Hofstede. Several results prove that differences do exist between

generic cultural factors and specific implementation in the usability / web environment. *Power distance*, *collectivism* and *uncertainty avoidance* are significant and important for British web users. In the case of the Chinese context, the four Hofstede dimensions have greatly differing significance. *Power distance* is very important, and *masculinity / femininity* less so, but international web site designers would be ill advised to ignore either of these two issues. Contrary to expectations, *individualism / collectivism* is not so important to Chinese users as the global expectations of the web would seem to predominate. *Uncertainly avoidance* is also not important, but perhaps it could be expected that this from Hofstede who suggests that long-term orientation is more significant.

Hofstede only suggested *uncertainty avoidance* to be relevant to Western cultures and this is vindicated in the fact that this factor was not found to be significant at all for Chinese users. In addition Chinese users were found to prefer *masculine* sites. Altogether, four of the Hofstede's cultural dimensions just account for 33.22% of variability, which is less than the 77.4% for UK users implying that other issues, not just Hofstede's cultural dimensions might also be important for Chinese users in effecting user preferences.

Language differences

In comparing differences between web users from China and the UK, language difference is so important and cannot be ignored. Chinese is a semantic-based logography in which the structure-meaning relationship are much close than in English. On the other hand, English is phonologically based, so we can use its visual form as a cue for pronunciation but cannot derive a word's meaning merely from its structure. For web site designers, only by translating text and contents from English to Chinese not always feasible or appropriate.

Cognitive abilities differences

Another problem with generalising standards derived from one culture to a different culture comes from differences in socio-cultural norms and cognitive styles. Many aspects of psychological functioning, from aesthetics to

interpersonal dynamics to motivations will vary from culture to culture. As a result, behavioural rules derived from one culture may not transfer to another. Choong and Salvendy (1999) found that for Chinese participants more than Americans, performance advantages were associated with concrete knowledge representation and with thematic interface structures.

Results from card sorting study (Study D) also concluded that Chinese users are more interesting in ***form*** (relating to the appearance or style of the page), whereas British users are more concerned with ***content*** (relating to the information contained within the page).

Semiotic differences

Results from pilot eFinance study (Study C) and semiotic anlysis (Study E) also show that there are semiotic differences between the two groups of users as discussed below:

In relation to the outcomes of Study C, the results show significant differences between UK and Chinese male expert users in one key area: Chinese users had a *lower preference* for detailed eFinance product information (product differentiation) as compared to UK users. It could be tentatively postulated that this is due to product presentation differences and consumer product familiarity differences.

- ***Product presentation*** A hypothesis could be proposed that the greater visual acuity, of Chinese users, might influence their preference towards product presentation. Product presentation is graphical or culturally bound, rather than text-based product descriptions.
- ***Product familiarity differences*** To some extent the differences, accounted for in terms of the social-semiotic differences could be found between China and the UK of key eFinance concepts such as 'loan, 'repayment', 'mortgage', 'credit' i.e. That is to say, the Chinese users are simply not expecting to need to assimilate detailed eFinance product information before making a decision

to borrow money because such products and loans are more commonly family negotiated, rather than institution led. This has important implications for those eFinance players considering entering the Asia-Pacific region: they must consider localisation from an architectural, strategic as well as a semiotic perspective if they are to be successful.

It could also be postulated that Chinese web site users may be adopting a generic 'holistic' preference (i.e. headline company 'brand-led' and key product led) for web-site content as compared with British users. British users, operating within highly developed markets, are more willing to research and interpret detailed web-based information. That is to say, they may be showing differential attraction to brand 'signs' operating at the innermost semiotic layer.

Results from Study E (semiotic analysis) also indicated that cultural attractors could affect different groups of users' attitude toward web sites, therefore, cultural attractors should be regarded as an important interface design element of the web site. These could reflect the signs and their meanings to match the expectation for the specific culture.

Usability /acceptability differences

During the three years research and case studies, most of British users regarded *usability* or *easy of use* as a mature concept and also a very important issue during their participating the user testing. In contrast, Chinese users rarely mentioned the core issues related to *usability*. It seems to be clear that much work such as usability education still need to be carried on in China.

10.4 Objective 3: Guidance on web site development

Having established and begun to quantify cultural differences the third and final key objective was as follows:
To relate such differences to the web site design process so as to provide guidance to web site developers in order to build usable sites in the Chinese context.

The overall thrust of the eCulture: UK and China research project has been to contribute to a full methodology for cross cultural web usability so as to make it being capable of reaching across cultural and international boundaries. The work underpinning this thesis also relates to part of the overall process model for developing usable cross-cultural web sites.

From both academic and commercial experience, the author and co-workers (Smith et al., 2004) identified three key issues underpinning usable web site development in a global context – *requirements for design*, *tools for design (interpreting requirements)* and *strategies for evaluation*. Furthermore, as shown in Figure 10.1, it could be believed that approaches to analysing these three issues lie on scales representing the extremes of theory and practice.

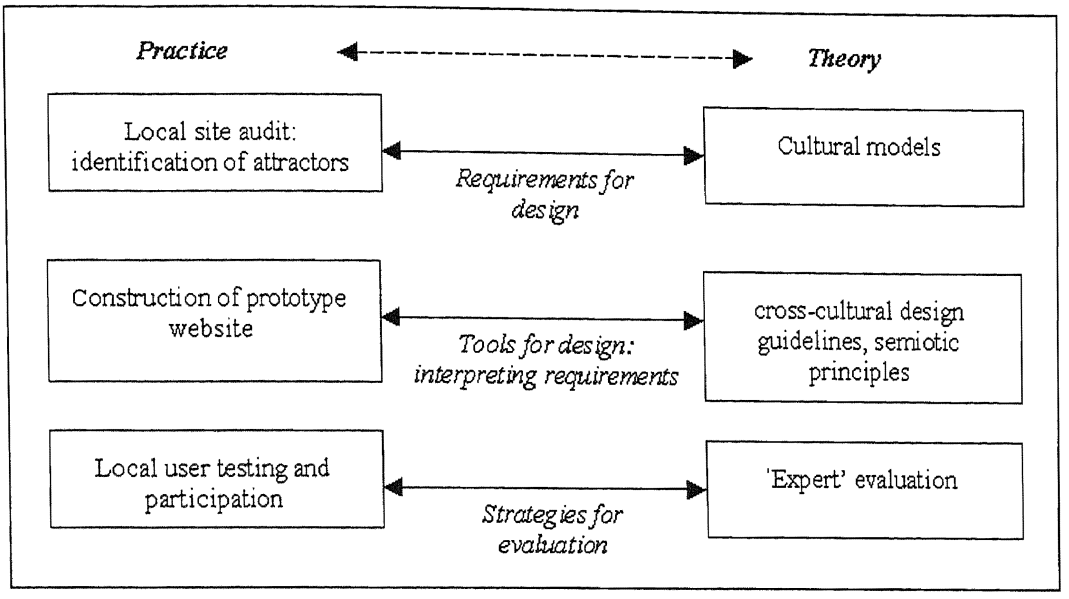


Figure 10.1: Issues underpinning international web site usability

In relation to the *requirements for design*, one approach is to undertake local web site audits to identify the elements that are indigenous to sites in the target culture. The alternative is to predictively apply theoretical models such as Hofstede when proposing designs. In respect of *tools for design* that successfully translate requirements in to usable solutions, a theoretical approach is to apply the limited but developing cross-cultural guidelines, whereas a practical approach would require effective prototyping. The same issues are mirrored in evaluation strategies: either test prototypes with real users in the target culture, or evaluate against cross-cultural heuristics. For significant international projects it is likely that tools and techniques selected from across all three dimensions will be necessary for effective design.

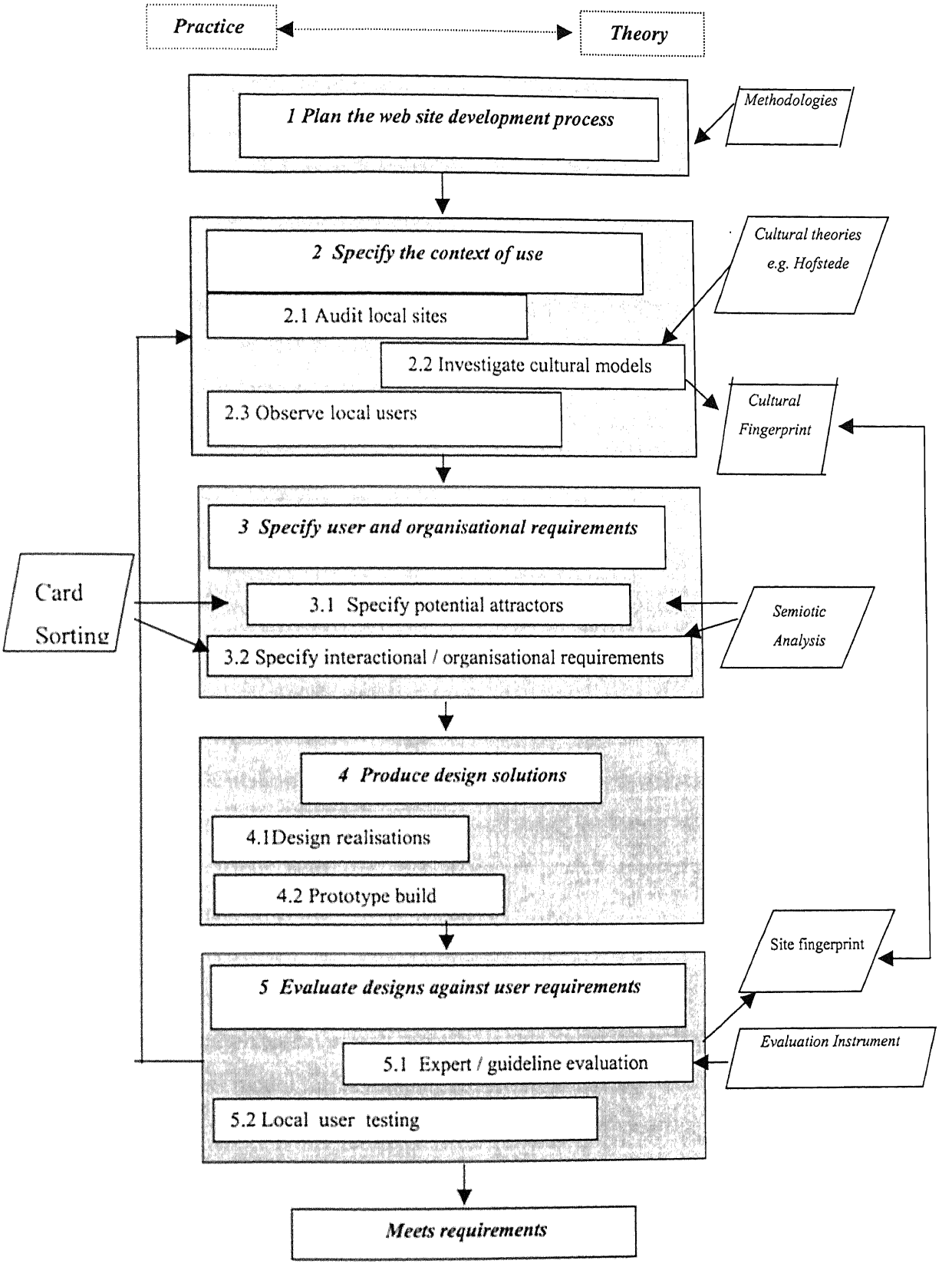


Figure 10.2: Process model for developing usable cross-cultural web sites

The author and co-workers (Smith et. al 2004) also proposed a ***process model*** for developing usable cross-cultural web sites. The term *process model,* as opposed to methodology, tool or techniques, is adopted following the definition given by Smith (1997):

'Providing a framework in which methodologies are defined through their use and can be taken as representative of the sequence of stages through which a software product or information system evolves'.

The process model (as shown in Figure 10. 2) is in effect an abstraction of the framework for user centred development activities specified in ISO 13407 – Humans Centred Design of Interactive Systems. As with ISO 13407, the process model (Figure 10.2) comprises of five stages, four of which are implicitly joined in a loop. Although the process is iterative it could be converted to a waterfall life-cycle model by simply going through once only. However, the true benefit of this model emerges when it is used to guide an iterative development process. The actual presentation of the iterative stages is shown in a linear flow. By so doing it is possible to superimpose the scales of theory and practice in this process model and the various activities also could be placed appropriately on a horizontal dimensions.

Several methods, such as *card sorting*, *semiotics analysis* and *cultural and site fingerprint* which have been reported in this thesis, have provided contributions to this process model for developing usable cross-cultural web sites.

10.5 How does this research contribute to knowledge?

It should be emphasised that this thesis presents some novel approaches to the investigation of cultural and usability / acceptability differences between Chinese and British users.

Although top-down and bottom-up approaches are not new techniques for this research, the strategy adopted here has been both efficient and successful.

A number of key contributions to knowledge have emerged:

1) Top-down and bottom-up research analyses

Top down approaches have verified classic cultural theories and results proved that differences do exist between generic cultural factors and specific implementation in the usability / web environment.

Bottom up approaches have been implemented for detailed investigations in the main differences in web site usability, cognition, shared meanings and acceptability between users from Mainland China and the United Kingdom. Starting from a low level and trying to move up to higher level construct, it has been possible to build more a concrete explanations of cultural differences.

From both top down and bottom up approaches, a fuller understanding of culture and web usability / acceptability is emerging. Further research based on the two ways of approaches would be tangible and feasible.

2) Taguchi method

The research also provides support for the validity of some of the earlier work on the use of Taguchi methods in this context (e.g. Smith and Dunckley, 1998). As it minimises the amount of costly user testing required, Taguchi methods offer considerable potential to study cross-cultural web usability / acceptably in cultural diversity context.

3) Cultural fingerprints

A major aim for this research has been to develop 'cultural fingerprints' for both web sites and users in different cultures. By comparing user and site fingerprint

the usability and acceptability of web sites can be diagrammatically matched to the target culture.

Experiments investigating qualitative factors and quantitative data collection and analysis based on Taguchi method has led to the development of two version of 'cultural fingerprint' for both web sites and target cultures in the UK and China. Cultural fingerprint and its applications could be extended other to a wider body of cultures, this could be regarded as the main contribution to cross-cultural web development research.

Differences do indeed exist between Chinese and British users and this work has substantially added to the understanding of such differences.

In summary, the work has both examined and quantified the cultural differences in web site user acceptance.

10.6 Further work

The three years of this research work reported here represents a further step for cross-cultural web usability / acceptability research. However, there is still much more work to be done in the future.

The first possibility for future work could be to renew and redevelop the most effective method of visualisation presentational / notations of the cultural fingerprints. There are many potential ways to combine more culture dimensions into current cultural fingerprints. It also possible to use other forms, such as 3D images for a better presentation of cultural fingerprints.

Secondly, web designers or web consultants have suggested a variety of usability guidelines for others to take into consideration when constructing web sites. Most of these guidelines are only based on experts' experience when working with web designs, but little if any empirical evaluation is performed to ensure that the guidelines actually do produce better web sites. The studies report here, not only

rely on the experts' evaluation, but also heavily take into account the web users' responses. Therefore, based upon the process model and cultural fingerprints (and underlying quantitative data), specific localised web development guidelines for China and the UK could be produced in the future.

Thirdly, it is also possible for extending the further empirical studies in other countries / cultures and to investigate cultural factors proposed by researchers (such as Hall and Trompenaars) other than Hofstede. The author would sincerely welcome suggestions for collaborative projects.

Finally, within the rapidly developing global information society, there is a greet need for usability and HCI in China in the near future. The methodology and outcomes of this research might be potentially and appropriately applied in the following domains:

- Chinese students applying and studying online courses from schools and universities of UK - **eUniversity**;
- International on-line trading between UK and China - **eTrade;**
- Governments' official business handling and exchanging between UK and China – **eGovernment.**

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APPENDICES

APPENDIX 1

ASSOCIATED PUBLICATIONS

Portions of the work described in this thesis have appeared in previous publications:

Smith, A., French, T., **Chang, Y.** and MacNeill, M. (2001). eCulture: a comparative study of eFinance web site usability for Chinese and British user, in D Day and L Dunckley (Eds), *Designing for Global Markets 3, Proceedings of IWIPS2001*, 12-14 July 2001, Milton Keynes, UK , ISBN 0-7492-53258.

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